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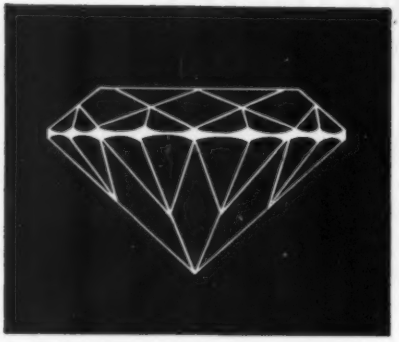

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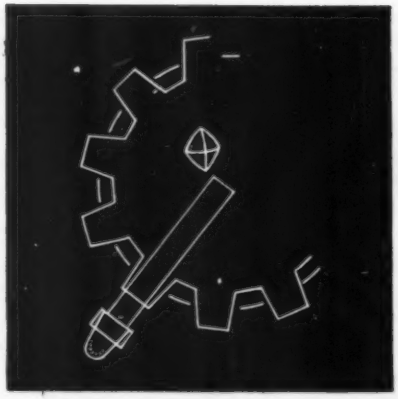

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November 1960

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PRINCIPAL CONTENTS

Generally Speaking	**Adamant**	**205**
Hanover Machine Tool Fair		**206**
Regular Phenomena of The Structure of Grinding Wheels as Chipping Tools (Concluded)	**Dr-Ing. J. Peklenik**	**214**

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Generally Speaking

Correct application

Last month we mentioned the necessity of using diamond tools correctly. It is however far too important a subject to dismiss with a passing reference and also it is a statement that needs some qualification if it is to be more than a platitude that could be applied to any material. But diamond is not just any material; it has unique characteristics which need to be thoroughly understood. On the one hand it is the hardest material known to man, yet it is extremely brittle. To guard against this brittleness and exploit this hardness and resistance to wear requires special tool geometry; machines must be free from all vibration and they must run at recommended speeds; the diamond point or cutting edge must be carefully protected when not in use. If these and other rules are observed, diamond tools will give long life and high quality production impossible with any other material. It is not possible to go into more detail in this column but there will shortly be some articles published in IDR which will examine and demonstrate these factors in detail.

Research

An equally important and complementary aspect of this subject is research. The emphasis is more and more to reduce costs and increase efficiency. Thanks to The Diamond Research Laboratory and other organisations, diamonds have more than played their part. Not only have techniques been improved but many applications are now possible which for years were considered impractical. To take advantage of these developments does entail some effort to keep up to date but the rewards in terms of economy and improved results will more than compensate time so spent.

ADAMANT.

Hanover Machine Tool Fair 1960

by our own Correspondent

Hanover, September 11-20

The 1960 Hanover Machine Tool Fair was as well organized and well displayed as one normally expects to find exhibitions staged on this admirable site. Seven of the main halls of the exhibition ground were in use for the general purposes of the exhibition and in addition there were special displays covering the use of iron and of aluminium in two of the smaller halls. Halls 1, 2, and 3 were principally devoted to shaping machines and lathes of various types, Hall 4 to grinding and gear cutting machines, Halls 7 and 8a to non-cutting metal working machines, measuring instruments and accessories, Hall 8b to milling and sawing machines, Hall 8e to boring machines, electro-working and ultrasonic machines, and Hall 8 to precision tools and machine tool accessories. The exhibition regulations had laid down a high degree of uniformity in the arrangement of the stands, which were on the whole extremely well laid out and arranged. As far as arrangements for the convenience of the visitor are concerned, the Hanover fairs are always amongst the best in Europe, and everything possible is done to ensure that the visitor can see the exhibits and make necessary enquiries with the least possible trouble. From the engineering journalist's point of view, however, one failing, common to nearly all such exhibitions, was noticeable. This is the difficulty which one finds in obtaining photographs, especially those of the newest and most interesting machines, for reproduction in reviews of the fair. This is a matter which is the fault of the individual exhibitors and not of the fair organizers, and although many of the exhibitors agree to send such photographs from their head offices, these sometimes fail to arrive, and in any case are the source of delay in the preparation of reports.

Fig 1. D. Drukker & Zn of Amsterdam (Stand 9529). On this stand was an excellent display of rough diamonds of all categories and a wide selection of diamond tools.

Diamond tool manufacturing companies

D. Drukker & Zn of Amsterdam (Fig 1) had an excellent display of rough diamonds of all categories and a wide selection of the diamond tools for which this firm is well-known throughout Europe. A large grinding machine (supplied by the German machine tool manufacturing firm of Thielenhaus) fitted with metal-bonded diamond grinding wheels was on display, and in addition a machine for the production of shaped diamond tools of a wide variety of forms (supplied by W. J. Wooster Ltd, Uxbridge, Middx, England) was shown on this stand. Special leaflets giving general information on the industrial uses of diamond were available and were freely taken by the visiting public.

Tesch

The display on the stand of Tesch Diamant-Keramik GmbH of Ludwigsburg/Wuertt covered their complete range and included both rough diamonds of a number of grades and finished tools ranging from grinding wheels to special shaped diamond lathe tools. The catalogues prepared by this firm are in an especially convenient and attractive form and give full and detailed information on their products in a manner making for very easy reference.

Urbanek

The firm of Johann Urbanek & Co of Frankfurt and Nuernberg not only had an excellent display of its products in the way of diamond tools on their stand, but had in addition a useful demonstration of many of these tools in use and a number of examples of the work which can be carried out with their assistance. The Urbanek catalogue not only gives a well-arranged classification of their products, but also includes a useful amount of general information on the subject of diamonds and their industrial uses.

Winter

The firm of Ernst Winter & Sohn, Hamburg, was showing not only its rough diamonds and diamond products, but also a number of other products (for example sintered carbides) used by this long established company. Demonstrations were being given of some of the uses of industrial diamonds and many of the firm's technical staff were available at the stand to answer queries and to make suggestions for such uses.

Other exhibits of diamond tools

In addition to the large displays of diamonds and diamond tools mentioned above, a number of other firms included diamond tools amongst their own displays. In some cases these diamond tools were imported from places outside Germany and included such well-known names as L. M. Van Moppes and Impregnated Diamond Products from England and Diametal of Biel, Switzerland. However, there were a regrettably large number of machine tools on show in the general part of this exhibition which might well have been fitted with diamond tools of one sort or another, but, in fact, were not so equipped. It was specially noticeable that many grinding machines were on display with mounts for diamond dressing tools, but no tool was in position. Quite a number of newly developed or newly improved machines was on show and the increasing trend towards automatic production was very apparent. This is, of course, a field in which diamond tooling with its characteristics of long life, small wear and excellent finish is particularly valuable, and several examples of the application of diamond tooling to automatic machinery in the automotive engineering field were to be seen. Some of this will be described in more detail later in this article.

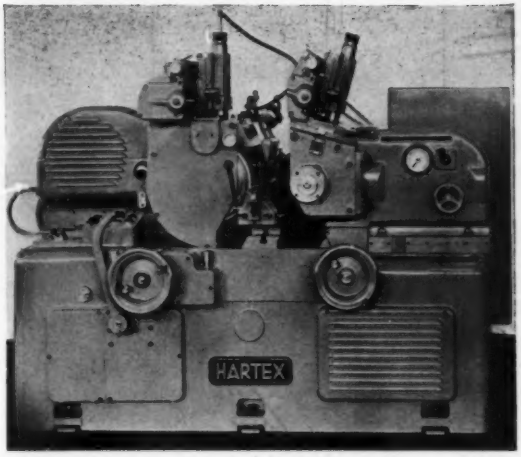


Fig 2. The Hartex BED5 centreless grinding machine designed for automatic operation.

Grinding machines

Hartex

Amongst the centreless grinding machines designed for automatic operation is the Hartex BED5 (Fig 2) made by the Hartex GmbH of Berlin-Marienfelde, who are represented in the United Kingdom by the Rockwell Machine Tool Company. Both the grinding wheel and the control wheel are individually adjustable for wear

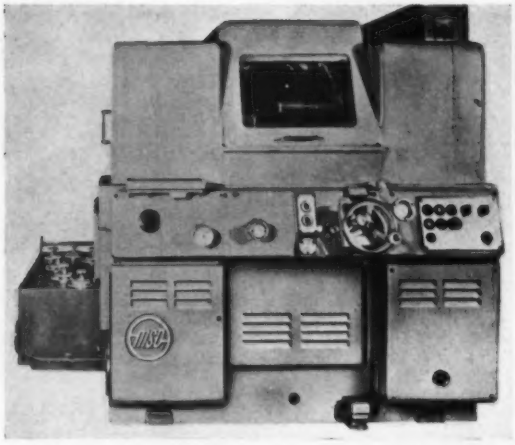


Fig 3. The MSO GA-1 thread grinding machine which has a fully automatic working cycle.

and are both fitted with hydraulically controlled truing devices which can be arranged so that the truing is carried out automatically with automatic adjustment for wear. In addition the grinding wheel truing device can be used for the formation of special profiles on the grinding wheel with automatic restoration to form after wear. The whole machine is completely automatic and fully self-contained with a hydraulic power plant built into the base. The diameter of the workpiece can vary between 5/32 in. and $4\frac{3}{4}$ in. and the maximum length ground in the normal arrangement of the machine is 10 inches. This can be increased for special applications.

MSO

Another machine with a fully automatic working cycle was the MSO GA-1 thread grinding machine (Fig 3) produced by MSO Maschinen und Schleifmittel Werke, Offenbach. These machines are individually designed for the specific purpose required and can be arranged to take workpieces of a maximum length of 9.85 in. between centres with a ground length of 4.92 inches. The maximum diameter on the ground section must be between 1.57 and 3.15 in., and the maximum diameter of the workpiece which can be accommodated in the machine is 7.87 inches. The hydraulically operated truing device can be arranged to be put into action after a pre-selected number of workpieces has been ground. The grinding wheel is automatically adjusted to allow for the reduction in size caused by the truing action. The cover over the grinding wheel and workpiece opens automatically in the last stage of the grinding cycle. The hydraulics of the machine are built into its base and the complete cycle can be pre-set by a series of control buttons.

Fig 4. The PFS3D profile grinding machine incorporates a very large screen optical projection system giving a possible magnification of 50 times.

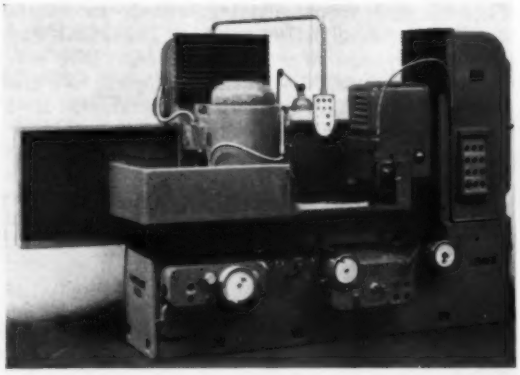


Fig 5. The model RWS6/7 compound grinding machine made by Kehren & Co. This model combines the characteristics of their earlier RS and RW machines.

PeTeWe

The PeTeWe Werkzeug-Maschinenbau Praezisions-Technik GmbH of Wertheim are represented in this country by Drummond-Asquith of Birmingham. One of the more interesting machines which was on show on this stand was the profile grinding machine PFS3D (Fig 4), which incorporates a very large screen optical projection system giving a possible magnification of 50 times. The control of this machine for profile grinding is by two large hand wheels of the car steering wheel type, and very accurate and delicate control is possible by these means. The machine can also be used for flat form grinding with automatic movement of the grinding wheel head.

Prohoma

The model RWS6/7 made by Kehren & Co, Hennef/Sieg (Fig 5) is a compound grinding machine combining the characteristics of their earlier RS and RW machines. The machine is fitted with a circular grinding table of the magnetic chuck type with a diameter of 25⅝ in. (RWS6) or 27½ in. (RWS7). This table can rotate at speeds of 15, 30 or 60 rpm and can have a traversing speed of up to 6½ ft/minute. Both the vertical and the horizontal grinding heads have automatic feed with automatic feed cut-out. The feed can be reduced to 0.00005 in./minute for fine finish grinding and material of a maximum thickness of 13¾ in. can be accommodated under either grinding wheel. This is a machine with very wide application and should be found to be extremely useful in workshops of a wide variety of types.

Reineker

The J. E. Reineker Maschinenbau GmbH of Einsingen/Ulm, was showing amongst other tools the automatic tool and cutter grinder WZS5 (Fig 6), which has a grinding head with its spindle

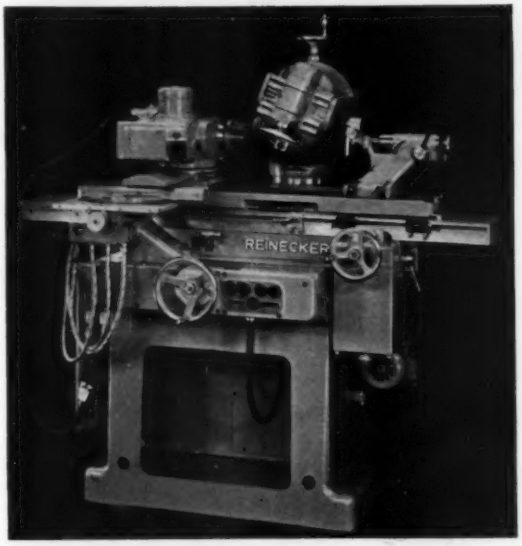


Fig 6. The WZS5 automatic tool and cutter grinder on display by J. E. Reinekar Maschinenbau GmbH.

universally adjustable in three planes. This machine is fitted with a wide variety of possible movements, so that tools and cutters of almost every type can be readily ground by using the appropriate setting. Separate truing tools for the grinding wheel flanks and face are fitted and the latter can be used for producing the appropriate radii on the wheel. The former (flank

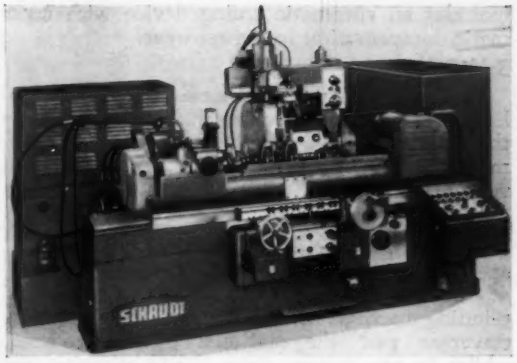


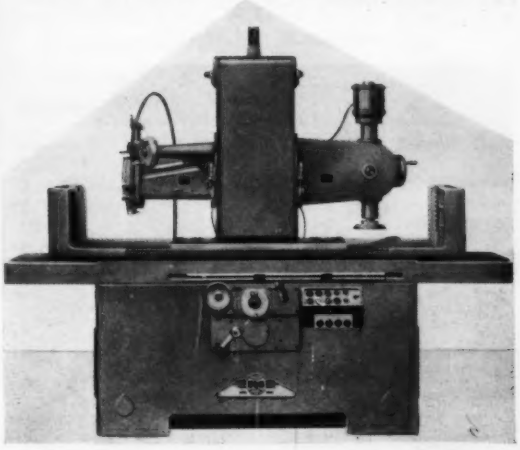
Fig 7. A fully automatic camshaft grinding machine exhibited by the Schaudt Maschinenbau GmbH of Stuttgart.

truer) may be fitted either to the grinding head itself or to the machine tailstock. The latter is mounted on a special compound slide with a swivelling holder, so as to give the widest possible adjustments. The machine is compact in form and neat in design and should find general acceptance for the purposes for which it is designed.

Schaudt

Yet another example of the trend towards automation was shown by the fully automatic camshaft grinding machine exhibited by the Schaudt Maschinenbau GmbH of Stuttgart (Fig 7). This is one of the many special purpose machines used in the automotive industry and can be set up to grind camshafts of any required form in a fully automatic cycle. The equipment

Fig 8. A new machine, shown by Edmund Lang, Flachschleifmaschinen, is the double headed SWB Fig 10 U surface grinding machine.



includes an automatic truing device with automatic compensation for wheel wear.

Schliff

Amongst the new machines shown by Edmund Lang, Flachschleifmaschinen, Babenhausen, is the double headed SWB Fig 10 U surface grinding machine (Fig 8) with one horizontal and one vertical spindle.

Schmaltz

The firm of Friedrich Schmaltz, Offenbach, specialises in heavy grinding machinery and one of their latest products is the type WR roll grinding machine. In this machine the workpiece traverses past the stationary grinding head, whilst in the similar type WRG machine the grinding head traverses past the workpiece, the model illustrated here as Fig 9. Either model can be arranged to give convex, concave or conical grinding as well as parallel forms. The dimensions of the workpiece which can be accommodated on these machines can be varied between wide limits according to the requirements of the customer. Surface grinders of large size (with grinding width of up to 59 in. and grinding lengths between 40 and 160 inches) are also manufactured by this firm in their AP surface grinder series (Fig 10). All these machines, whether of the horizontal or vertical spindle type are fitted for automatic work cycle operation, including, in the case of the horizontal spindle model, automatic truing of the grinding wheel.

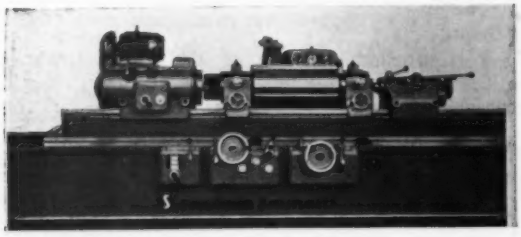


Fig 9 (above). One of the latest products of Friedrich Schmaltz; the type WR roll grinding machine.

Fig 10 (below). A large size surface grinder, by Schmaltz, with grinding width of up to 59 in. and grinding lengths between 40 and 60 inches.

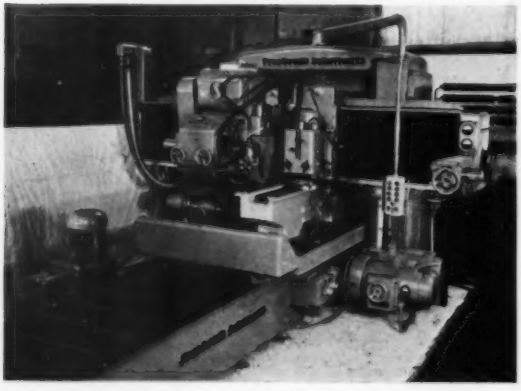


Fig 11. A particularly neat and simple double-wheel tool grinding machine shown by Thielicke & Co.

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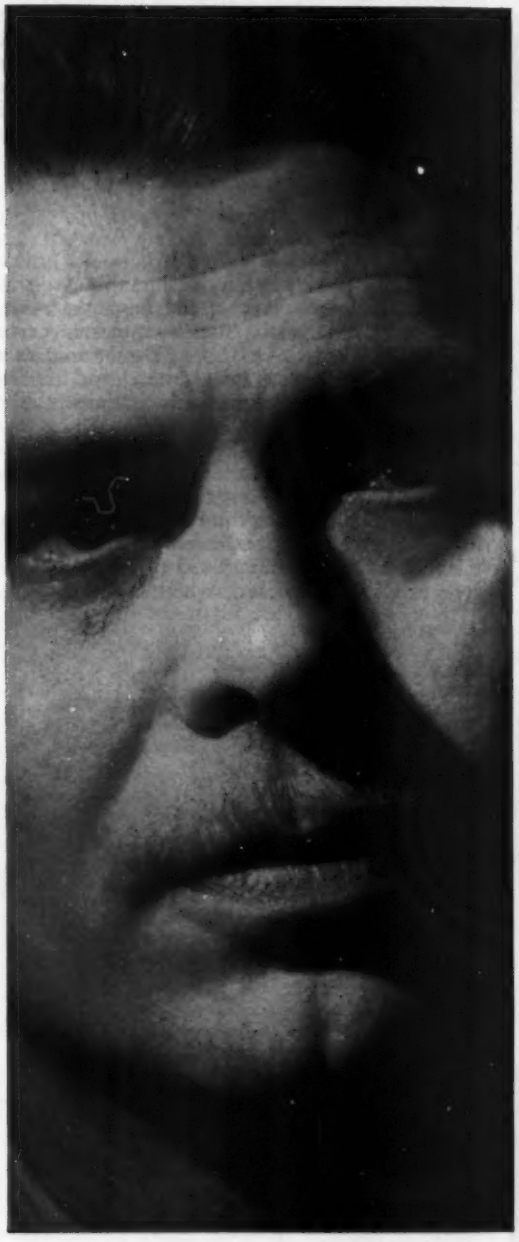
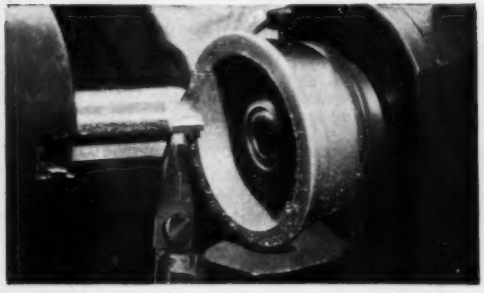


"We get more jobs out of each wheel with these" says **Tom Swain**

Tom Swain is the charge-hand of the cutter-grinding shop of Jonas & Colver (Tools) Limited. Most of the tools they grind there go to the motor industry or the aircraft industry. Among the most successful production tools that Tom's men use are the resin-bonded diamond wheels made by CARBORUNDUM shown in our smaller illustration. 'We find we get more jobs out of each wheel with these.' Tom says, 'And that's important with diamond wheels. Diamonds cost money!' He might have added that long wheel-life saves time spent in wheel changing, and so increases the production rate — not a big increase, but worth something in the course of a year.



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Thielicke

Thielicke & Co of Karlsruhe showed a particularly neat and simple double-wheel tool grinding machine (Fig 11) for sharpening of hardmetal tools or in some circumstances HSS tools. The two cup-wheels used for coarse grinding and finish grinding are mounted concentrically with the coarse grinding wheel as the outermost. After coarse grinding on this wheel has been completed, the fine inner wheel is moved forward and the process is completed with the wheel in this position. The machine can be fitted with a dividing head for grinding on multi-tooth cutters and can also be adapted for

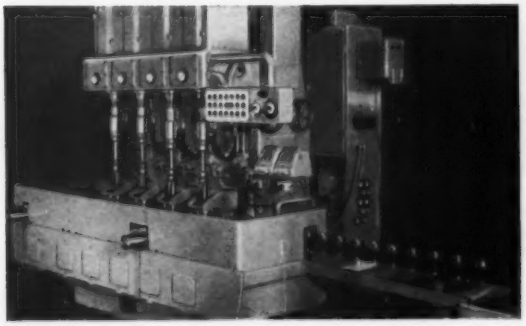
Fig 12. The combined set of Fritz Wendt electrolytically assisted diamond grinding equipment comprising the PS60E precision grinding machine, the SS60E chipbreaker grinding machine, and the Elimat 420.

grinding chipbreaker grooves. A microscope can be fitted for continuous examination of the ground edge during the grinding process. Great care has been taken in the design of the machine to avoid all unnecessary vibrations.

Thielenhaus

Although their range includes many types of grinding machine and similar equipment, micro-

Fig 13. A highly specialized honing machine, model 1Z400, of Gehring KG.



finishing machines of a wide variety of types are the speciality of the Maschinenfabrik Ernst Thielenhaus of Wuppertal-Barmen. These machines are all designed for completely automatic work cycle and have been applied with very great success to finishing of races of ball and roller bearings. Charts produced on the Talyrond surface measuring equipment indicate clearly the success with which these machines can be operated.

Wendt

The electrolytically assisted diamond grinding technique, which is being considerably developed in these days and has special advantages when grinding mixed metals, such as tungsten carbide tool tips brazed on to normal steel shanks are concerned, as both the hardmetal and the steel can be worked simultaneously without the disadvantages which may be encountered in ordinary grinding. Fritz Wendt KG of Duesseldorf have specialised in this type of equipment for some time and were showing their combined set of equipment comprising the PS60E precision grinding machine, the SS60E chipbreaker grinding machine and the Elimat 420 (Fig 12). A third type of grinding machine which can also be used

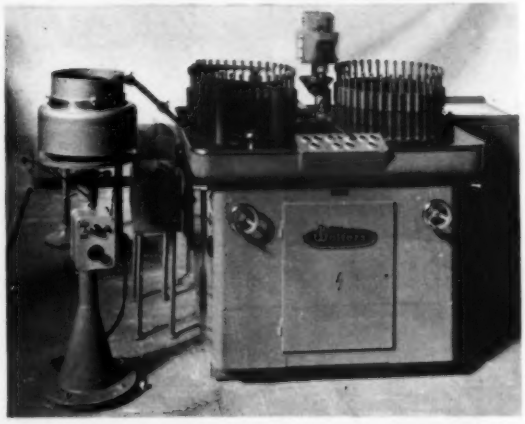


Fig 14. An automatic lapping machine for use in the motor car industry; made by Peter Wolters of Mettmann.

in conjunction with the Elimat supply cabinet is the model SSR60E, which can be used as a small cutting tool grinding machine. Controls of all these machine are similar and variations are confined to the arrangement of the actual working heads. In most cases an Elimat 420 supply unit will be sufficient to feed two or more of the grinding machines at once.

Two special machines

Two of the special machines designed for use in the motor industry, as part of the change-over

to automation, mentioned earlier in this article, are the special honing machine and lapping machine described below: The honing machine is in use at, amongst other places, the Volkswagen factory, where it is employed for the continuous automatic honing of the cylinder bores.

Gehring

The Maschinenfabrik Gehring KG of Stuttgart has been responsible for the development of a number of highly specialised honing machines, including the model 1Z400 shown in Fig 13. This is a machine which is arranged for incorporation in a fully automatic factory with automatic transfer of the parts between machines. Four separate honing spindles, each independently controlled and fitted with the firm's own specially designed sizing attachment, hone the bores of internal combustion engine cylinders to extremely fine limits. These particular machines are fitted with impregnated diamond hones manufactured by the English company of Impregnated Diamond Products. The machines can be fitted with a number of accessories, such as magnetic swarf separators and coolant refrigeration, in order to remove, as far as possible, all the factors which may make it difficult to produce a standard consistent product.

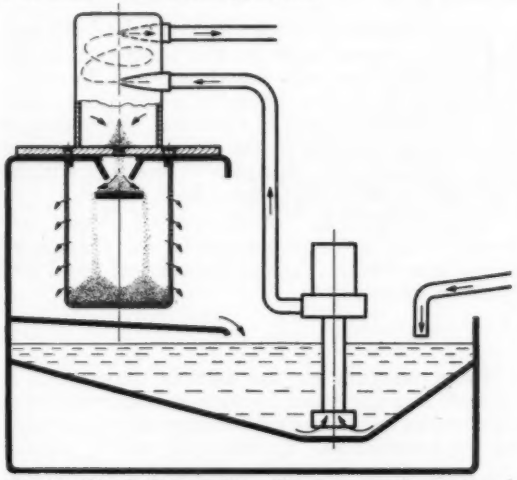


Fig 15. The Zyklon coolant filter ensures the continued cleanliness of the coolant.

Wolters

Another automatic machine used in the motor car industry is the automatic lapping machine made by Peter Wolters of Mettmann. Amongst other processes for which this machine is suitable, are the fluid control valves in hydraulic shock absorber systems. The machines are fitted with two lapping mounts operating on opposite sides of a single lapping wheel and each

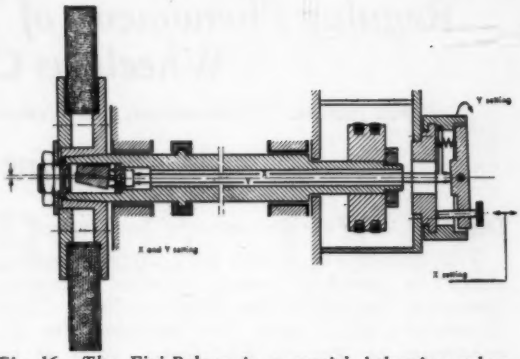


Fig 16. The Fini-Balanz is a special balancing arbor which enables the operator to adjust a grinding wheel for any out-of-balance running.

fitted with its own individual feed and take-off equipment. In the illustration, Fig 14, both the mounting wheels can be seen, but only one of the feeding devices is visible. The exact method of feeding to be employed depends on the type of workpiece being used and the machine can be readily adapted to take a number of different types of part without necessity for any major alterations.

Ensuring a good finish

However excellent a grinding machine itself may be and however carefully it may be set up to operate, the finish produced can never be entirely satisfactory, if amongst other precautions care is not taken to ensure the continued cleanliness of the coolant and really vibration-free running of the grinding wheel. The Fortuna Werke Spezialmaschinenfabrik of Stuttgart have produced equipment to look after both of these problems. Their Zyklon coolant filter (Fig 15) operates on the cyclone principle and includes a readily removable filter sack which allows any remaining fluid in the separated sludge to seep back into the main coolant supply tank. Another product by the same firm is the special balancing arbor, the Fini-Balanz (Fig. 16) This equipment includes an electric vibration meter connected to the grinding wheel spindle and a mechanical balancing device incorporated in the spindle itself, which can be adjusted during the actual running of the wheel. By a simple alteration of two knobs on the wheel head the operator can adjust the wheel for any out-of-balance running at any time and can get direct indication on the meter dial of the success of this operation. The actual balancing equipment is relatively simple in design and can be readily adjusted to make allowance for any out-of-balance occurring because of the wear of the wheel during the grinding operation.

Regular Phenomena of The Structure of Grinding Wheels as Chipping Tools

Report from the "Laboratorium fuer Werkzeugmaschinen und Betriebslehre der TH Aachen."

by Dr-Ing. J. Peklenik

Continued from p. 195.

Determination of the dimensions of bond bridges

The bridges, which hold the particles together, should be considered one of the most important structural elements of the grinding wheel. Their dimensions affect more than anything else the properties of the grinding wheel, such as its hardness and its texture.

The volumetric constituent of bond per particle V_{bk} is a factor which gives the measurements of the bond bridges in relation to the particle size. The shapes and the dimensions of bond bridges are manifold. M. C. J. Matthijsen (5) established that the particles are thinly covered with the bond. The bond bridges were made visible by illumination of the cutting surface of the grinding wheel with a high-pressure mercury vapour lamp.

In Fig 9 the characteristic formation of the bond bridges is reproduced by a method developed by the writer. The particles on the surface of the wheel are polished to about $d_k/2$. The photograph of the surface shows clearly the particle surface, the schematic bridges, and the pores. In Fig 10 the bridge forms are represented. The curve formed links are characteristic of the bridge formation, and were also indicated by N. E. Filonenko (1).

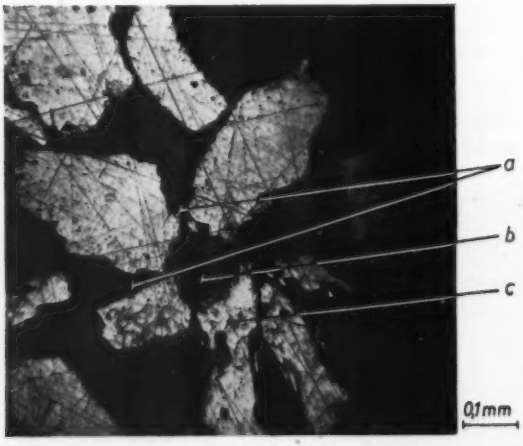


Fig 9. Formation of bond bridges in the grinding wheel.

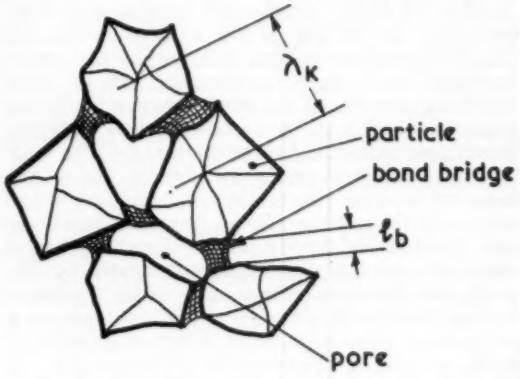


Fig 10. Schematic representation of bridge forms in the grinding wheel.

The properties of the grinding wheel do not, naturally, depend only on the bond constituent per particle, but are also influenced by other factors, such as the chemical composition and the size of the crystals in the bond, the release of the cutting material in the bond zones between the particles and bridges. These questions will not be considered here, however.

The volumetric constituent of bond per particle V_{bk} is in proportion to the volume of the single particle V_{ke} and the ratio of bond and particle constituent:

$$V_{bk} = V_{ke} \cdot \frac{V_b}{V_k} . \qquad (13)$$

From research on the particle dimensions it is seen that the most frequently occurring form of particles in the first approximation corresponds to the octahedron. Equation 13 can be written for the average bond constituent $\overline{V}_{bk}$ as follows:

$$\overline{V}_{bk} = 0.67\, \overline{d}_{kg}^{\,3} \cdot \frac{V_b}{V_k} . \qquad (14)$$

For the numerical calculations the average values of the smallest measured particle dimension $\overline{d}_{kg}$ are used (see Table II).

The reason why the calculations of the bond

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constituent per particle and their variations are referred to the distribution of the particle dimensions, or rather their statistical measurements, is that these dimensions can be measured exactly. It is more likely that more bond falls on a particle with larger dimensions than on a smaller particle. The fact that the bond constituent V_{bk} is proportional to the volume of the particle V_{ke} ought to be most true in this case.

The bond constituent per particle V_{bk} is used in further experiments as an initial dimension for the determination of some statistics of the grinding wheel, namely, 1. for the measurement of the bond bridges, and 2. for the limits in the manufacture of grinding wheels.

The bridge measurements can be obtained only in their average lengths, $\overline{l}_b$ and in their cross section $\overline{F}_b$ by calculation with the bond constituent $\overline{V}_{bk}$. First of all, though, the actual particle separation distance λ_k must be known. The difference between the average particle measurement and this particle separation is equal to the average bridge length $\overline{l}_b$.

It is impossible with present day experimental methods to determine by measuring technology these dimensions, i.e. length l_b, breadth l_a, and depth l_c. A possibility of determining the actual distance between particles λ_k experimentally, was found in hardness tests on the grinding wheel, where the individual particles lying one behind the other were torn out with a ripping bit (9).

For these reasons it was attempted to find out the actual distance between particles λ_k from the volumetric ratios and the constant particle sizes d_k.

There is no lack of attempts to determine the dimension λ_k by calculation. G. Pahlitzsch and H. Hemerdig (7) in their formula for chip depth give the λ_k value equal to the particle diameter.

$$\lambda_k \approx d_k \qquad (15)$$

E. N. Maslov (4) suggested a way in which the particles of sphere-shape with the diameter d_k are examined. As a model of the spatial arrangement of particles a cubic-flat centred lattice was taken. With regard to the number of particles n_k per Pond, the specific weight γ of the cutting material, and the volumetric constituent of particles in the grinding wheel V_k, he made up the following formula for λ_k:

$$\lambda_k = \sqrt[3]{\frac{10^5}{V_k \cdot \gamma \cdot n_k}} . \qquad (16)$$

K. E. Schwartz (10) worked on the same lines in the determination of the actual distance between particles λ_k. But he took, for the distribution of the particles, the densest sphere-packing, i.e. the cubic-space centred lattice. The equation for λ_k reads:

$$\lambda_k = \sqrt[3]{\frac{1.95 \cdot 10^5}{V_k \cdot \gamma \cdot n_k}} . \qquad (17)$$

Equations 16 and 17 differ essentially in the constants in the Nominators. This difference is due to the different data in the arrangement of the particle distribution.

The calculations according to Equation 16 of E. N. Maslov give theoretical values for λ_k, for it is inconceivable that the particle separation distance diameter λ_k is smaller than the average particle diameter $\overline{d}_k$ considered (compare Table VI, p54 in (4)). On the other hand, Equation 17 gives acceptable values for λ_k. The inaccuracies in the calculation of the actual distance between particles should occur in the change behaviour of the specific weight γ and the number of particles per Pond. The γ values can vary in corundum between 3.3 and 3.95 $\frac{\text{Pond}}{\text{cu cm}}$, which affects the number of particles, especially in medium and fine particles, to a considerable extent. The number of particles n_k per Pond as a result of this is subject to considerable variations. The deviations are hard to determine, for the mechan-

TABLE 5

Average distances between particles for different grain sizes and structures in mm

Grain size		10	16	20	24	36	46	60	80	100	120	150
$\overline{d}_k$ in mm		2.415	1.751	1.477	1.056	0.780	0.537	0.382	0.298	0.189	0.148	0.139
Texture grades N_k	3	2.930	2.111	1.790	1.280	0.946						
	4	2.960	2.142	1.810	1.295	0.956	0.658	0.468				
	5	3.000	2.175	1.835	1.311	0.970	0.666	0.475	0.371			
	6	3.040	2.205	1.860	1.330	0.984	0.675	0.481	0.375	0.238		
	7	3.080	2.235	1.885	1.350	0.997	0.685	0.488	0.381	0.241	0.189	0.177
	8					1.010	0.695	0.494	0.386	0.245	0.192	0.180
	9								0.392	0.249	0.195	0.183
	10										0.198	0.185

ical counting of some tens of thousands of particles takes a lot of time.

For this reason another way was tried in order to determine the actual distance between particles λ_k from the particle measurements. The introduction of the expression for λ_k is made as far as possible: the number of particles per unit of volume of the grinding wheel (cu cm) is

$$Z = \left(\frac{10}{\bar{d}_k}\right)^3 \cdot \frac{V_{ko} - \varphi_s N_s}{100} \qquad (18)$$

$$\bar{d}_k = \frac{\bar{d}_{k1} + \bar{d}_{k2}}{2}$$

From Equation 18 the number of particles per unit of length (cm) is

$$Z_1 = \frac{10}{\bar{d}_k} \sqrt[3]{\frac{V_{ko} - \varphi_s N_s}{100}} \qquad (19)$$

After conversions the following expression is obtained for Z_1:

$$Z_1 = \frac{2.16}{\bar{d}_k} \sqrt[3]{V_{ko} - \varphi_s N_s} \qquad (20)$$

and the actual distance between particles $\bar{\lambda}_k$ is

$$\bar{\lambda}_k = \frac{10}{Z_1} = \sqrt[3]{\frac{4.63\bar{d}_k}{V_{ko} - \varphi_s N_s}} \qquad (21)$$

In Table 5 the values for the actual distance between particles λ_k for different texture grades

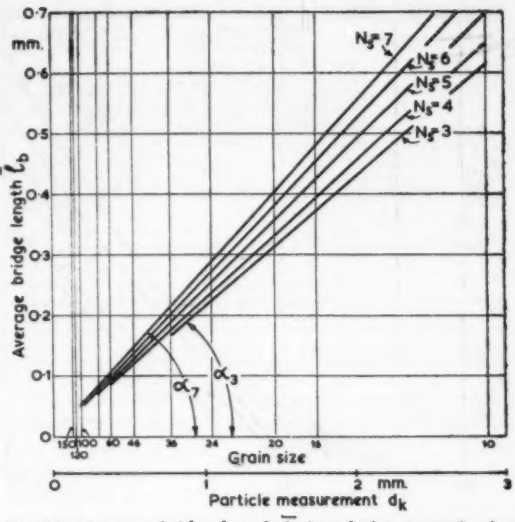
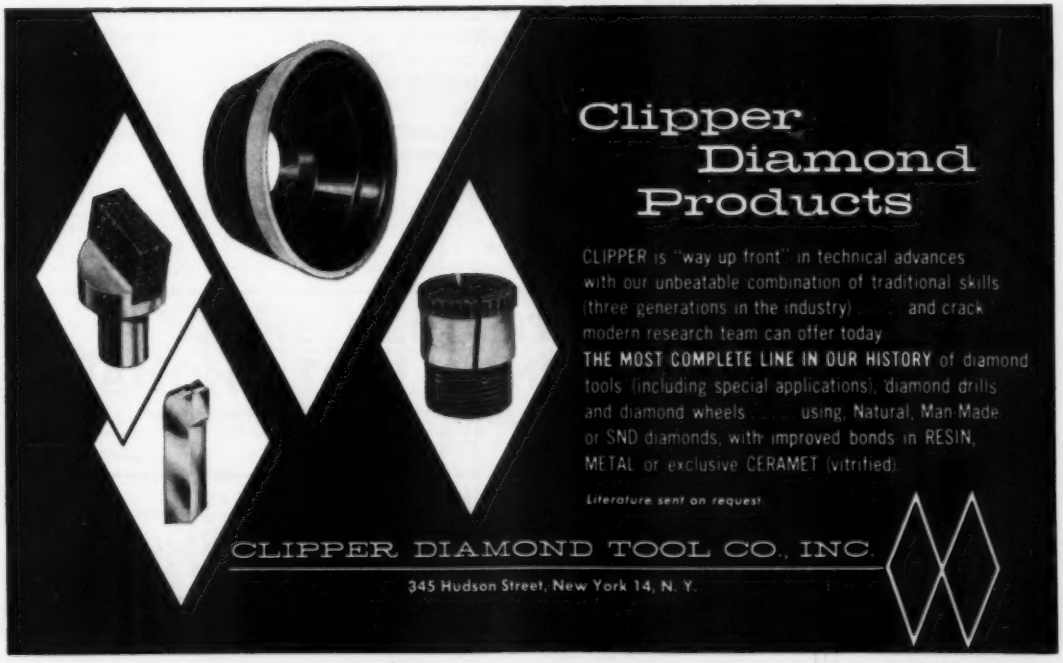


Fig 11. Average bridge length $\bar{l}_b$ in relation to grain-size

N_s and grain sizes are put together. The length of the bond bridges $\bar{l}_b$ is given from the difference of the particle distance $\bar{\lambda}_k$ and the particle diameter $\bar{d}_k$:

$$\bar{l}_b = \bar{\lambda}_k - \bar{d}_k. \qquad (22)$$

By inserting Equation 21 for λ_k in Equation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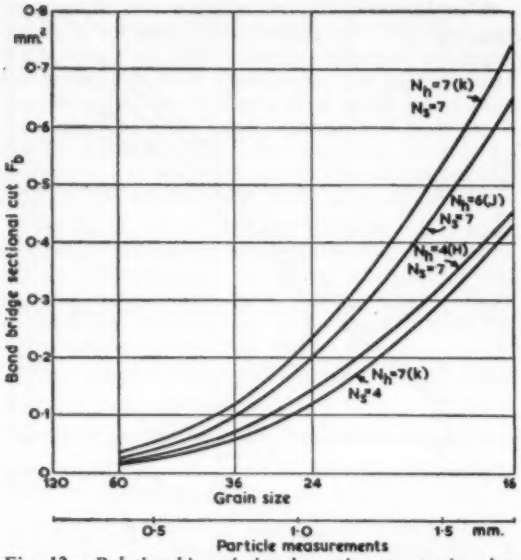

Fig 12. Relationship of bond section to grain size.

22 the length of the bond bridges is obtained as:

$$\bar{l}_b = \bar{d}_k \operatorname{tg} \alpha N_s,$$

$$\text{where } \operatorname{tg} \alpha N_s = \frac{4.63}{\sqrt[3]{V_{ko} - \varphi_s N_s}} - 1 \qquad (23)$$

The length of bond bridges $\bar{l}_b$ depends on the average particle measurement $\bar{d}_k$ and the volumetric constituent of the grain-size V_k. The factor $\bar{l}_b = f(\bar{d}_k)$ can be defined as an even integer running through the zero point of the coordination system. In Fig 11 the links $\bar{l}_b = f(\bar{d}_k)$ are reproduced.

A further value, which indicates the measurements of the bond bridges, is their diagonal section F_b per particle. It has not yet been experimentally indicated which forms the sectional surface can assume, but this would be very difficult. For this reason the problem is handled in such a way that the diagonal section F_b has been examined quantitatively only on the surface. The average section of the bond bridge F_b per particle can be expressed as follows:

$$\bar{F}_b = \frac{V_{bk}}{\bar{l}_b} \cdot \qquad (24)$$

It is clear that the value F_b is composed of several constituents F_{b1}, F_{b2}, ... F_{bn}, for it is impossible for the particle to be held in place by only one bond bridge. The bridge length l_b is not influenced by this, however, because it is not dependent on the bond constituent in the grinding wheel.

In Fig 12 the bond sections $\bar{F}_b$ are given above the particle sizes $\bar{d}_k$ for a few hardness grades and textures. Further values can easily be obtained from the equations given above for any chosen grinding wheel measurement.

Thus a few quantitative data on the bridge measurements have been found. The knowledge of the measurements of bond bridges is of especial importance in the examination of hardness and elasticity characteristics of grinding wheels. These values can naturally not define any clear bond strengths, which are necessary to break the individual particles out of the bond. But the course which the bond strengths tend to follow is given in the first approximation.

Definition of bond equivalent

In the experiments so far performed it has been shown according to what rules grinding wheels are constructed. The large number of possible combinations which arises owing to the variety of grain-sizes, and hardness and texture grades, is not used in the manufacture of grinding wheels. It is known that in practice not every hardness and texture grade can be prepared for a certain grain-size. So for example grinding wheels with a coarse grain can only be prepared in the higher hardness grades between $N_h = 11$ and 16, and in the closer texture $N_s = 3$ to 8. Also the finer grain-sizes can only be prepared in the hardness grades $N_h = 2$ to 12 and in open textures $N_s \approx 7$ to 10.. By means of the introduction of the ' bond equivalent ' q, a dimension is defined which makes it possible to determine the limits in the production of grinding wheels; furthermore, this dimension also enters into hardness tests.

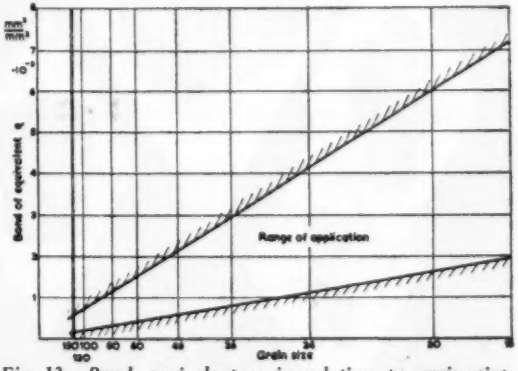

Fig 13. Bond equivalent q in relation to grain size.

The bond equivalent tells what volume of bond falls on a unit of the surface of a particle. This value can be expressed as follows:

$$q = \frac{V_{he}}{F_k} \text{ cu mm/sq mm.} \qquad (25)$$

With regard to the equations 2, 3, and 9, the following expression is valid after conversion for the bond equivalent q:

$$q = 0.152\ \bar{d}_{k2}\ .\ \frac{\varphi_o N_s + \varphi_h N_h - K}{V_{ko} - \varphi_o N_s} \text{ cu mm/sq mm} \qquad (26)$$

The calculations of the bond equivalent according to the data given above for grinding wheels in relation to the grain-size produce the graph shown in Fig 13. With grain-size 36 the values for q vary between q min $= 0.8 \cdot 10^{-2}$ cu mm/sq mm for the texture $N_s = 3$ and q max $= 3.0 \cdot 10^{-2}$ cu mm/sq mm for the texture $N_s = 8$. A division of this region for the grain-size in question cannot yet be made out from the data available with regard to texture and hardness.

In Fig 14 the regions are de-limited, in which certain textures can be manufactured in relation to the hardness. So for example a grinding wheel cannot be made in the grain-size 46 with texture 4 in hardness K and O, but with texture 7 up to hardness Q. Similar experiments could be performed for other grain-sizes as well.

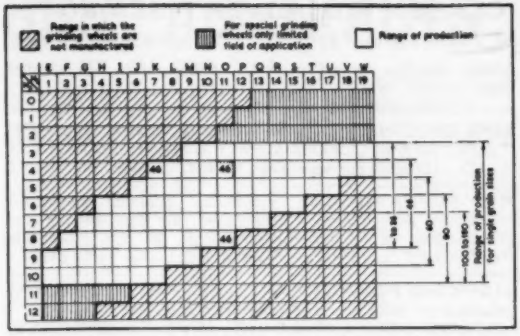
Range in which the grinding wheels are not manufactured
For special grinding wheels only limited field of application
Range of production
Range of production for single grain sizes

Fig 14. Range of application of hardness and of texture grades in the production of grinding wheels.

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N.B. The reference for this article on p. 186 is incorrect. The correct reference will be found on p. 214. We apologize for any inconvenience this error may have caused.

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	Page
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Compentrad Ltd.	215
Diamant Boart	202
Diamond News, The	220
Drukker, D. & Zn. N.V.	204
Habit Diamond Tooling Ltd.	Cover III
Henderson Diamond Tool Company, Ltd., The	219
Impregnated Diamond Products Ltd. ...	Cover IV
Indusmond (Diamond Tools) Ltd	203
Industrial Diamond Co. (Sales) Ltd. ...	Cover II
Smit, J. K. & Sons (Diamond Tools) Ltd. ...	201
Triefus & Co. Ltd.	Cover I
Wolverhampton Diamond Die & Tool Co. Ltd.	203

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1960 Volume 17
NOVEMBER

DIAMOND MINING AND INDUSTRY

£9,000 diamond discovery [:] Rich pothole near Kimberley

Anon. *Financial Times* 1960 (22185) p 7 (Sep 12)

A rich pothole at Longlands, a small town near Barkly West some 20 miles from Kimberley, yielded a 195 ct diamond worth about £9,000 recently. The syndicate of four diggers now expects to make a fortune as a result of a £3,000 breakwater across the Vaal started in Jan, 1960. *D* *F.12.3612*

Mining miscellany

Anon. *Min J* 1960 Vol 255 (6523) p 236 (Aug 26)

It is reported from Freetown that the Diamond Corporation (Sierra Leone) is to prospect for gold and platinium under an agreement signed with the government allowing the Corporation to investigate deposits of diamonds which might still exist in the disused swamps and terrace gravels outside the Sierra Leone Selection Trust lease areas. Any diamond recovered during prospecting must be sold through the Government Diamond Office, proceeds of sales being refunded to the Diamond Corporation up to the amount of their expenses.
D *Bfba.13.3672/Bfbc.13.3672/F.13.3672*

Diamond [:] Sierra Leone

Anon. *Miner Tr Notes* 1960 Vol 51 (2) p 27 (Aug)

According to the *Sierra Leone Royal Gazette* of April 26, 1960, the Minister of Lands, Mines and Labour declared certain parts of the Koinadugu and Kambia Districts as an alluvial diamond mining area. The Chief Inspector of Mines is reported to be making arrangements to demarcate prospecting plots, issue the licenses and permits required, and to superintend operations of the alluvial diamond mining plan.
D *F.25.3672*

Diamond rush in Borneo

Anon. *Min Mag, Lond* 1960 Vol 103 (2) p 103 (Aug)

Thousands of people have swarmed through jungles in central Borneo recently in search of diamonds, according to a report from Jakarta, Indonesia. They have been heading for the Kahaju Hulu district, following a report that four men had found diamonds in a shallow stream in Sungai Pinang village when they were washing vegetables. *X* *F.25.3752*

Complaint against U.S.S.R. diamond planners

Anon. *'Mindrill' Bits & Pieces* 1960 Vol 13 (4) p 6 (June)

Mr. Mityushkin, Yakutsk delegate, addressing the Supreme Soviet in Moscow, said that diamond output so far this year was already 2.4 times that of the whole of 1958. He complained that Soviet planning authorities were not paying sufficient attention to developing installations needed in the diamond mining fields about the new city of Mirny, and asked for an additional allocation of 200,000,000 roubles in capital investment to assure the completion on schedule, in 1961, of a number of installations.
D *F.25.33:.132*

The development of the diamond industry in Yakutia

M. Corper. *Industr Diam Rev* 1960 Vol 20 (231) pp 29-30 (Feb)

Based on material by G. Granik and G. Naumov, the article traces development since 1940, when the diamond bearing nature of the Siberian plateau between the Rivers Lena and Yenisei was proven theoretically.
See also *Industr Diam Abstr* 1960 Vol 17 p A162 (July). *D* *Ebe.332/F.25.332*

Diamond production in Yakutia

Anon. *Min J* 1960 Vol 255 (6523) pp 231-232 (Aug 26)

A survey of the USSR's progress and problems in the development of the Yakutia diamond fields, based on reviews of recent Russian books which appeared in *Mineral Trade Notes*.
See *Industr Diam Abstr* 1960 Vol 17 p A233 (Oct).
D *F.13.332*

Development of diamond mining in the U.S.S.R.

G. A. Vvedenskii. *Mat i soob Issl otd Inst po izuch SSSR* 1959 (9) pp 22-27 (Nov); *Library of Congress Mthly Index Russ Access* 1960 Vol 13 (4) p 1292 (July) (Original in Russian)
D *F Hd.33:.132*

Minerals, metals and man

C. W. Dannatt. *New Scientist* 1960 Vol 8 (200) pp 724-727 (Sep 15)

The need for organizing international planning and research into the difficulties inherent in a possible future scarcity of minerals is stressed. A simple map shows the distribution of the chief deposits of non-metallic minerals, including diamond. 4 illustr, 3 tables, 1 ref.
D *Bc.131/F.131*

CONTENTS

Diamond Mining and Industry	A269	Rock Drilling	A283
Physical, Chemical, and Mechanical Properties of Diamond	A270	Wire Drawing	A285
		Grinding and Polishing of Carbides and Metals	A285
Physical, Chemical, and Mechanical Properties of Hard Materials	A272	Machining Developments	A292
		Production, Grading and Recovery of Abrasive Particles	A293
Diamond, etc, in Instruments	A273	Tool Production	A294
Hardness and Wear Testing	A275	Powder Metallurgy	A295
Truing of Grinding Wheels	A275	Miscellaneous	A295
Precision Machining of Metals	A278	Book Reviews	A296
Cutting and Machining of Stone, Glass, etc	A281	Trade Literature	A296
Gem Polishing	A282	Patent Lists	A298

Siberia—diamonds

B. TSyv'ian. *Sem'ia i shkola* 1958 Vol 13 (3) pp 25-27 (Mar); *Library of Congress Mthly Index Russ Access* 1960 Vol 13 (4) p 1441 (July) (Original in Russian)

D *F.21*

Diamond mines and mining [:] Treasure hunters

B. Aleksandrov. *Smena* 1959 Vol 36 (23) pp 12-13 (Dec); *Library of Congress Mthly Index Russ Access* 1960 Vol 13 (4) p 1292 (July) (Original in Russian)

D *F.12.33*

Beating the black market in diamonds

Anon. *Gemmologist* 1960 Vol 29 (347) pp 110-111 (June)

Describes the position in Sierra Leone by the end of 1959 with regard to illicit diamond mining and dealing.

D *F.25.2598.3672*

How a rush takes place today [:] Diggers' tales

Anon. *Gemmologist* 1960 Vol 29 (347) pp 112-113 (June)

Describes the diamond rush at Pypklip in the Western Transvaal early in 1960. *D* *F Hd.361*

Spanish import regulations

Anon. *Industr Diam Rev* 1960 Vol 20 (325) p 109 (June)

Industrial diamonds to the value of $100,000 are included in a list of goods under the Spanish import global quotas system for 1960.

D *Fc.251.3245*

Australia's gemstone industry

Anon. *Min J* 1960 Vol 255 (6521) p 173 (Aug 12)

Extract from *Mineral Resources of Australia, Summary Report No 43, Gemstones.*

Apart from gem opal, Australian production of gemstones has been very small. Diamond and emerald deposits were worked for some time in a few places in NSW and W Australia. The discovery and production of gemstones, other than those mentioned, have been incidental to alluvial mining for other minerals. Only at Copeton in NSW has there been any relatively large-scale attempt to mine diamonds. Mining and recovery methods are described. In general, about 5% of Australian diamonds are suitable for gem purposes.

D *Bb.13.25.38/F.13.25.38*

Conveyor system replaces 2,000 cocopans

Robins Conveyors (SA) (Pty) Ltd. *S Afr Min Engng J* 1960 Vol 71 Pt 1 (3513) pp 1371, 1373 (June 3)

A new 10,000 ft long overland conveyor system for connecting Wesselton Mine with the central treatment plant at Kimberley has replaced 2,000 cocopans each of 0.8 tons capacity, while releasing many workers for other jobs. The conveyor carries 600 tons of diamond-bearing blue ground. The system is described. 2 illustr.

D *F Hd.361*

Synthetic diamond patents

Anon. *Min J* 1960 Vol 255 (6523) p 238 (Aug 26)

A report from New York states that the General Electric Co has been granted patents on the process and apparatus for making synthetic diamonds. The patents, issued by the US Patent Office, cover the 'basic' high-pressure equipment used in making the stones in addition to later improvements in the equipment. *D* *Fh Ha.1456.545:.342*

News in brief

Anon. *Industr Diam Rev* 1960 Vol 20 (233) p 76 (Apr)

Moscow physicists have designed a portable field apparatus to detect diamonds in soil samples by means of radioactive isotopes.

X *Az Ec F Hz Syb*

PHYSICAL, CHEMICAL, & MECHANICAL PROPERTIES OF DIAMOND

Cross relaxation studies in diamond

P. P. Sorokin, G. J. Lasher, I. L. Gelles. *Phys Rev* 1960 Vol 118 (4) pp 939-945 (May 15)

A microwave double resonance experiment performed on the para-magnetic nitrogen centres in diamond shows that in this system cross relaxation occurs via a four spin flip mechanism which exactly conserves Zeeman energy. In the process, two spins of the centre line make a downward transition while a spin belonging to each satellite makes an upward transition. Simple rate considerations of this process indicate that if a saturating microwave field is suddenly applied to one of the three lines of the nitrogen spectrum, a weak probing microwave signal at either of the two other lines should register a definite change in absorption in a time T_{21}. Specifically, if T_{21} is much less than other relaxation times of the system, then setting the pump upon the centre line should force the absorption at either satellite to drop to zero. Setting of the pump at the position of one of the satellites, on the other hand, should reduce the centre line absorption to 3/5 its thermal equilibrium value but should increase the absorption measured at the other satallite by the factor 6/5. This behaviour was precisely observed at 1.6° K, using a bi-modal cavity.

By resolving the rate at which a satellite decays to zero when the pump is set on the centre line, T_{21} is measured for all five satellites in the three principal orientations: $H_0 \parallel [100]$, $H_0 \parallel [110]$, and $H_0 \parallel [111]$. The measured anisotropy is discussed.

It is shown that the four spin flip transition may be used in special cases to establish continuous wave maser operation by inverting the population of one of the satellite lines. Steady state inversion of one of the nitrogen satellites is incidentally observed in a number of diamonds. 7 illustr, 12 ref, 1 table.

A *F Ub/F Ukjc*

The luminescence spectra of diamonds

G. O. Gomon. *Optics & Spectroscopy* 1960 Vol 8 (4) pp 275-277 (Apr) (Original in Russian)

A study was made of the luminescence spectra of a series of diamonds from Russian deposits. It was found that the variety in luminescence colour and intensity was caused by a change in the absolute and relative intensities of the blue and yellow-green components of the spectrum. The structure of the blue component remained the same in different diamonds, but appreciable variations were observed in the yellow-green band. 1 illustr, 5 ref.

See also *Industr Diam Abstr* 1960 Vol 17 p A236 (Oct). *D* *F Ukn*

Infrared absorption spectra of diamonds of different types

S. C. Sirkar. *Indian J Phys* 1960 Vol 34 (1) pp 13-19 (Jan)

The infrared absorption spectra of ten specimens of diamond, of which the fluorescence and absorption spectra had been studied earlier, were investigated using a Perkin-Elmer Model 21 spectrophotometer. Two of these diamonds, transparent up to about 2300 AU in the ultraviolet region and producing no fluorescence band at 4156 AU, exhibit only very weak infrared absorption in different regions, while the other specimens show some or all the absorption bands reported by previous workers. It has been concluded from these results that these infrared bands, excepting the band 1,360 cm^{-1}, are due to impurities and are not produced by characteristic vibrations of the diamond lattice. The band 1,360 cm^{-1} has been assigned to the vibration in those portions of the lattice which are under strain due to presence of impurities. 4 illustr, 2 tables, 7 ref. *A* *F Ukjcb*

How to detect artificial diamonds

G. R. Crowningshield. *Guilds* 1960 Vol 15 (5) p 9 (May)

Cyclotron and atomic pile treated diamonds come in a wide variety of colours. They are analyzed with a hand spectroscope. The 5920 absorption line is indicative of treated stones, but it may be bleached from a stone heated above 400° centigrade. The 5040 and 4980 lines common to many natural stones are also being used as an aid to indentification ; the 5040 line is stronger in natural stones, but after treatment the intensities are reversed. *L* *Fh Hkb*

Solid state physics—a symposium

Indian Institute of Science (Dept of Physics) ; Physical Research Committee, Council of Scientific and Industrial Research. *J sci industr Res* 1960 Vol 19A (6) pp 240-242 (June)

The first technical session covered the Raman and infrared spectra of crystals, neutron diffraction, and the structure of solids. R. S. Krishnan summarized important results obtained at the Indian Institute of Science regarding the Raman spectra of crystals by using the resonance radiation of mercury as exciter ; he then dealt with the contribution to Brillouin scattering in crystals, and diamond in particular. The relative intensity of the transverse and longitudinal Brillouin components in diamond was shown to be in good agreement with that calculated using the values of piezo-optic constants reported recently by Poindexter. *D* *Vh.371.541*

Pure carborundum and green diamonds

Anon. *New Scientist* 1960 Vol 8 (202) pp 836-837 (Sep 29)

More than one hundred scientists engaged in studying the physical properties of diamond, either as a unique crystal or as an industrial hard material, attended a diamond physics conference programme at Reading University. Interest was shown in reports about the colouration of diamond when it is subjected to atomic particle bombardment. Bombardment with a 2 MeV beam of electrons produces a green colour, but this turns brownish when the diamond is heated to 600° centigrade.

Reports on other technologically important hard materials, in particular silicon carbide, included a Dutch contribution describing a relatively simple way of producing pure crystals of silicon carbide. *D* *F Hxb Ukb.131/F Um.131*

Using magnification to determine stones of high index

R. T. Liddicoat jun. *Guilds* 1960 Vol 15 (5) pp 8-9 (May)

There are various causes of failure to obtain a reading on the refractometer : a common one is that the stone's refractive index is above the scale, but it is then possible to separate certain stones, including diamonds, under magnification. Often a diamond may be hard to identify, *eg* it may have bad cleavages or be very badly cut. Identifying growth marks that sometimes appear on a diamond under magnification are described. If a refractive index is needed, the Duc De Schaulnes method is recommended. A Leveridge Gauge and a microscope are used, the method being explained. *L* *F Hkb*

Interferometric studies on synthetic diamonds

S. Tolansky, I. Sunagawa (Royal Holloway College). *Industr Diam Rev* 1960 Vol 20 (235) pp 106-109 (June)

The interferograms described here, which were taken on synthetic diamonds, bear hardly any resemblance to the many interferograms on natural diamond faces taken in the authors' laboratory. These differences and the reasons for them are discussed. 7 illustr.

See also *Industr Diam Abstr* 1960 Vol 17 p A58 (Mar). *D* *Fh Vr.21*

The influence of the crystallographic orientation on the wear of truing diamonds

G. Pahlitzsch. *Industr Diam Rev* 1960 Vol 20 (231) pp 31-37 (Feb)

Describes experiments carried out on diamonds of various crystallographic orientations to discover which face offered the most resistance to wear. Two groups of diamond tools were tested, one of gem and the other of industrial quality, and both showed that the octahedron face offers the greatest wear resistance. In an additional experiment with a rough diamond, it was found that the natural surface is harder than the diamond core, but is quickly penetrated as it amounts to only 30 to 50 micron. 12 illustr, 6 ref. *K* *Nj Unr:Ubc*

Letter to the editor

W. Stern. *Industr Diam Rev* 1960 Vol 20 (233) p 78 (Apr)

The writer comments on Prof. Pahlitzsch's article on the influence of the crystallographic orientation on the wear resistance of truing diamonds, and presents some further factors that must be taken into account when considering a method of prolonging the life of truing diamonds.

See *Industr Diam Rev* 1960 Vol 20 (231) pp 31-37 (Feb). *D* *Nj Unr:Ube*

Calibration by diamond formation

Anon. *Battelle Tech Rev* 1960 Vol 9 (7) p 15 (July)

During one of the pressure calibrations of Battelle's 'girdle' ultra-high pressure apparatus, diamonds are produced. By detecting the usual transitions in bismuth, thallium, and barium, the calibration is extended to beyond 120,000 atm, as shown in a graph. Diamonds, recently made during a check on calibrations and identified by their characteristic X-ray diffraction pattern, were produced using molten nickel as catalyst. The cube face of one of the crystals revealed an unusual growth structure, which is photographed here. 3 illustr. *D* *Fh Ha Uklb*

Genetic relationship between diamonds and carbonates found in kimberlites

V. S. Petrov. *Vest Misk un Ser biol, pochv, geol, geog* 1959 Vol 14 (2) pp 13-20 ; *Library of Congress Mthly Index Russ Access* 1960 Vol 13 (4) p 1292 (July) (Original in Russian) *D* *Ebb F*Ebb Ff*

Recent data on the solution of diamond crystals

A. A. Kukharenko, V. M. Titova. *Uch zap LGU* 1957 (215) pp 103-134 ; *Library of Congress Mthly Index Russ Access* 1959 Vol 12 (5) p 1314 (Aug) (Original in Russian) *D* *Fd U*

Natural diamonds still top synthetic

Anon. *Metalworking Prod* 1960 Vol 104 (32) p 9 (Aug 10)

Refers to Diamond Research Laboratory's natural diamond grit for metal bonded matrices.

See also *Industr Diam Abstr* 1960 Vol 17 p A163 (July) ; A211 (Sep). *D* *Kl.361*

DIAMOND TECHNOLOGY

First published 1942 as "Production Methods for Diamond and Gemstone." The second edition of this book by P. Grodzinski has been revised throughout and considerably enlarged. 840 pages, 486 illustrations, 94 tables, and indexes. From NAG Press Ltd., 226 Latymer Court, London W 6. 55s 0d, post free.

PHYSICAL, CHEMICAL, & MECHANICAL PROPERTIES OF HARD MATERIALS

Dislocations and twinning in graphite

A. J. Kennedy. *Proc Phys Soc* 1960 Vol 75 Pt 4 (484) pp 607-611 (Apr 1)

5 illustr, 3 ref. *A* *Bhb Ube/Bhb Unk*

Thermal expansion of germanium at low temperatures

S. I. Novikova. *Fizika Tverdogo Tela* 1960 Vol 2 (1) pp 43-44 (Jan); *Sov Phys, Solid State* 1960 Vol 2 (1) pp 37-38 (July) (Original in Russian)

The thermal-expansion coefficient of silicon becomes negative at low temperatures [1, 3, 5]. To elucidate the nature of this anomalous dependence of α on temperature it would be desirable to know the behaviour of the thermal-expansion coefficient in substances similar to silicon in their physical and crystallographic properties. Such a substance is germanium, which is a semi-conductor crystallizing out with the diamond-type lattice. Investigations are described. 2 illustr, 5 ref.

D *Bfr Udc Vbc*

Some applications of the discrete Fourier transform to problems of crystal lattice deformation I.

I. Babuska, E. Vitasek, F. Kroupa. *Czech J Phys B* 1960 Vol 10 (6) pp 419-427 (June)

The theory of the discrete Fourier transform [1], [2] is applied in solving a system of difference equations describing the positions of atoms in a deformed crystal lattice. The crystal lattice is approximated by the Born-Karman model modified to include the internal energy of the undeformed crystal. 3 illustr, 11 ref.

X *Ubb Unk*

Method for the detection of flaws in yttrium garnet crystals

E. Buehler, M. Tanenbaum. *J appl Phys* 1960 Vol 31 (2) pp 388-390 (Feb)

6 illustr, 8 ref. *A* *Bbh.2591*

Catalog of very hard crystals

E. E. Flint. *Library of Congress Mthly Index Russ Access* 1960 Vol 13 (4) p 1288 (July) (Original in Russian)

Book, Izd-vo Akad nauk SSSR, Moscow. 1959, 50 pp. [Not in library of Industrial Diamond Information Bureau]. *D* *Bd Unh.514*

Some optical properties of solid solutions of arseno-selenides and arsenotellurides of indium

D. N. Nasledov, M. P. Pronina, S. I. Radautsan. *Fizika Tverdogo Tela* 1960 Vol 2 (1) pp 50-51 (Jan); *Sov Phys, Solid State* 1960 Vol 2 (1) pp 44-45 (July) (Original in Russian)

At the present time, increasing attention is being directed toward new semi-conductor compounds possessing a diamond-type structure. Solid solutions of indium arsenide base, recently investigated by Goryunova and one of the present authors, are representative of these compounds. Results are described. 2 illustr, 6 ref.

D *Bfn Ubb*

New synthetic emerald

Anon. *Goldsm J* 1960 Vol 66 (498) p 359 (Aug)

A new form of synthetic emerald is reported to have been manufactured in Europe under the tentative name of 'Emerita'. The emeralds are grown from a seed or core which is faceted so that the synthetic stone, as it comes from the manufacturing process, is of unpolished faceted shape. A faceted clear or faintly coloured beryl is used for a seed. *D* *Bbjbb Qc*

The significance of surface finish on friction, wear and lubrication

A. Sonntag. *Industr Diam Rev* 1960 Vol 20 (234) pp 86-90, 92-99 (June)

Paper presented at the Seminar on Friction, Lubrication and Wear, Lucerne, Sept, 1959.

Attempts a general review of surface finish, how it is defined and how it is measured. Recent data is presented which may help towards a better surface geometry for boundary friction, wear and lubrication. The text is illustrated with tables, diagrams, and photographs, which assist in explaining experiments performed in such studies and in clarifying the terms and definitions used to describe surfaces. 26 illustr, 4 tables, 21 ref. *D* *Unf.21*

Macroscopic steps on a crystal surface

I M. Lifshits, A. A. Chernov. *Kristallografia* 1959 Vol 4 (5) pp 788-791 (Sep-Oct); *Library of Congress Mthly Index Russ Access* 1960 Vol 13 (4) p 1288 (July) (Original in Russian)

D *Ubm*

National Engineering Laboratory research on materials and their fabrication

National Engineering Laboratory, East Kilbride. *Metallurgia* 1960 Vol 62 (369) pp 29-35 (July)

Particular attention is given by the Materials Div to the problem of metal fatigue. The work ranges from fundamental physical studies of the mechanism of fatigue to investigations of the strength of components such as pin joints. 4 illustr. *D* *B.131*

High-temperature properties of ceramic and hard metal cutting tools

I. S. Brokhin, I. I. Ol'Khov, A. B. Platov. *Tsvetnye Metally* 1959 Vol 32 (10) pp 75-82 (Oct); abstr *Metal Powd Rep* 1960 Vol 14 (8) p 150 (Apr)

D *Pdc U Vbb/Pdd U Vbb*

Ardoloy Grade AK . . .

Anon. *Mach Tool Rev* 1960 Vol 48 (286) pp 115-116 (July-Aug)

Further successful applications illustrated show the adaptability of Grade AK to all types of machining where, either because of the nature of the operation or the material itself, ordinary grades of carbide fail after cuts of only short duration. Having a virtual immunity to chipping of the cutting edge, this toughness, which is the most remarkable feature of Ardoloy Grade AK, is said to permit continuous heavy metal removal usually limited only by the capacity of the machine to traverse the tool at coarse feeds and great depths of cut, using medium to low speeds. The advantages over other standard carbide tools are reported to be most impressive on heavy planing, boring, plano-milling and similar operations. 6 illustr.

See also *Industr Diam Abstr* 1960 Vol 17 p A143 (June). *D* *Bfd Ceq Pdc Unl*

Premium grade carbide

Wickman Ltd, Wimet Div, Coventry. *Metallurgia* 1960 Vol 62 (369) pp 40-41 (July)

A new grade of carbide, Wimet XL35, for milling steel, is said to combine wear resistance and toughness to an unusual extent. Despite hardness of approximately 1,500 VPN, selection of correct grain structure gives the carbide superior resistance to thermal cracking at the cutting edge. In all milling applications so far tested, tool life has been considerably extended in comparison with other grades.

D *Rg Unr*

Some properties and metallography of steel bonded titanium carbide

M. Epner, E. Gregory (Sintercast Corp). *Trans Metall Soc AIME* 1960 Vol 281 (1) pp 117-121 (Feb); *Metal Powd Rep* 1960 Vol 14 (8) p 145 (Apr)

D *Rge.21*

Metals reinforced by ceramic fibres

Horizons Inc, Cleveland, Ohio. *New Scientist* 1960 Vol 8 (198) p 581 (Sep 1)

Ceramic fibres are being combined with metals by an experimental process said to yield materials of extraordinary strength. One alloy which approaches the exacting requirements of the process contains 80% nickel and 20% chromium. The most suitable fibre is an aluminium oxide of sapphire or corundum in single crystal form. The technique is briefly described.

D *Bf Cs:Bl*

Technical briefs

Universal Metallic Packing Co Ltd. *Min J* 1960 Vol 255 (6523) p 235 (Aug 26)

Deva alloys, now being produced in this country, are claimed to combine the advantages of solid metal and solid graphite without possessing their extreme characteristics. Besides having properties which permit the exceeding of service limitations of existing self-lubricating materials, the alloys are also said to be easily machinable. Other features are described. 1 illustr. *D* *Bfx*

DIAMOND, ETC, IN INSTRUMENTS

Certain diamonds are semi-conductors

Anon. *Electron Industr* 1960 Vol 19 (5) p 5 (May); *Instrum Abstr* 1960 Vol 15 (8) p 422 (Aug)

Interest is reported in the possibility of using a semi-conductor diamond for very sensitive temperature measurement based on the variation of resistance with temperature. *X* *Fn.21*

Industrial diamonds on show : From scientific research to heavy industry

Anon. *Industr Diam Rev* 1960 Vol 20 (230) p 6 (Jan)

Refers to the exhibition of the industrial and scientific uses of diamond, presented by the Birmingham City Museum and Art Gallery, 17 Feb - 16 Mar, 1960. Exhibits included a refractometer using a diamond as the prism, a scratch resistance tester with a diamond point, and a radiation meter with a diamond as the sensitive detector. *D* *N.27*

Electron probe methods of X-ray microanalysis

P. Duncumb. *Brit J appl Phys* 1960 Vol 11 (5) pp 169-176 (May)

11 illustr, 54 ref. *D* *Vjf.1456*

The work of the National Engineering Laboratory

National Engineering Laboratory, East Kilbride. *Machinery, Lond* 1960 Vol 97 (2486) pp 61-67 (July 6)

Some current developments are discussed, including the production of diffraction gratings, air flotation slides, and steplessly-variable speed transmission for machine tools. 4 illustr.

D *Pr Psc.132/Tfd.132*

Accuracy of selected-area microdiffraction in the electron microscope

A. W. Agar. *Brit J appl Phys* 1960 Vol 11 (5) pp 185-189 (May)

8 illustr, 4 tables. *D* *Wcmm*

Moiré fringes for machine tools

Anon. *Mach Shop Mag* 1960 Vol 21 (9) pp 569-571 (Sep)

2 ref. *D* *Pr Tfdz*

Moiré fringe reading head for use with a fine grating

D. A. Palmer (National Physical Lab). *J sci Instrum* 1960 Vol 37 (8) pp 261-262 (Aug)

2 illustr, 9 ref. *D* *Tfdb*

A new plane grating spectrograph

P. Kroeplin (VEB Carl Zeiss, Jena). *J sci industr Res* 1960 Vol 19A (7) pp 308-310 (July)

Modern 'blaze' or mirror-surface gratings do not consist of ruled an unruled areas, but the entire surface of the aluminium is deformed into a saw-toothed stepped surface by the division produced with an asymmetrically ground diamond. 6 illustr, 1 ref.

D *Az Bfg Cp Nc*

Use of optical equipment for checking machine tools for missile production

G. W. Donald (GEC). *Machinery, Lond* 1960 Vol 97 (2491) pp 333-335 (Aug 10)

5 illustr. *D* *Pr Qd Wc*

A new measuring instrument for small diameter holes

W. Krieg. *Jena Rev* 1959 Vol 4 (4) pp 130-131 (Aug)

The main application of the Small-Bore Measuring Microscope is probably the direct measurement and inspection of the accuracy of shape and of measuring and testing equipment such as drill plug gauges. Testing in the production of jewel bearings, miniature ball bearings, *etc*, can also be done. The wall of the boring is touched by means of measuring spheres, which are said to be resistant to mechanical damage to a great extent. The method of alignment and measurement and the design of the operating elements are claimed to ease the working process considerably, and reduce errors to a minimum. 7 illustr.

D *Vfd Wcm*

Zeiss measuring control instrument 'Pneumat'

G. Meister, H. Rasch. *Jena Rev* 1959 Vol 4 (4) pp 126-129 (Aug)

Describes design and capabilities of the instrument, for which several novel features are claimed, and gives examples of its application in various grinding processes. 7 illustr, 2 ref. *D* *Chc Wp*

The digitized measuring microscope

Hilger & Watts Ltd, Camden Rd, London NW 11. *Industr Diam Rev* 1960 Vol 20 (235) p 114 (June)

A measuring microscope fitted with digitizers is said to have many advantages, including greater speed and ease of use than a standard instrument, and reduced likelihood of error. The operating principle of the digitizer is explained. 1 illustr.

D *Vfd Wcm*

Electronic control for machine tools

Anon. *Engineering, Lond* 1960 Vol 190 (4916) pp 54-55 (July 8)

A new method of automatic three dimensional control for machine tools incorporates direct measurement of machine movement without the use of mechanical drives or optical elements. 3 illustr.

A *Pr Wpz*

Hahn & Kolb vertical micrometer comparator

Hahn & Kolb, Stuttgart ; British rep : Optical-Mechanical (Instruments) Ltd, 17 Station Rd, Egham, Surrey. *Machinery, Lond* 1960 Vol 97 (2496) p 626 (Sep 14)

1 illustr. *D* *Wcz*

Optical inspection and measuring equipment

Matchless Machines Ltd, 18 Bolton St, Piccadilly, W 1. *Tooling* 1960 Vol 14 (7) p 82 (July)

Describes Isoma optical equipment shown at Olympia, including the M.103 workshop microscope with a range of 1.6 in. × 3.6 in., and the M.104 optical hardness tester for Vickers hardness testing. 1 illustr.

See also *Industr Diam Abstr* 1960 Vol 17 p A124 (May). *D* *Wcm/Wghc*

Heston Magnoptic optical comparators

Heston Aircraft & Associated Engrs Ltd, Heston Airport, Hounslow, Middx. *Machinery, Lond* 1960 Vol 97 (2496) pp 638-639 (Sep 14)

Three types of optical comparators for industrial applications are available : the Heliscope, Vertex, and Revelation for use, respectively, on the work bench, in the production inspection department, and in the standards room. Details of each are given. 3 illustr.
D *Wcz*

Microptic precision clinometer

Anon. *S Afr Min Engng J* 1960 Vol 71 Pt 1 (3514) p 1439 (June 10)

A microptic precision clinometer reads direct to one second of arc and with estimation of 0.5 sec over an angular range of 0-360 degrees. It is suitable for inspecting angular surfaces and gauges, locating jigs and fixtures, setting inclinable tables on jig borers, and for angular work on grinding and lapping machines. The instrument and its operation are described.
D *Pr Vfd W*

Surface finish measuring instrument

Vision Engineering Ltd, Send Rd, Woking, Surrey. *Mass Prod* 1960 Vol 36 (8) p 71 (Aug)

The Optosurf operates on a split field microscope principle which combines an illuminated and magnified image of workpiece surface and surface of one of the masters produced to B.S. specification and mounted in an indexing turret. With attachments, bores down to 1/16 in. diameter and up to 80 ft in length can be inspected, as well as external surfaces. 1 illustr.
A *Unf Vfd Wcmz*

Optical micrometer

Link Aviation, Binghamton, NY. *Canad Mach & Metalworking* 1960 Vol 71 (8) p 150 (Aug)

Model 214 Fringecount micrometer for direct measurements to one millionth of an inch now has a non-wringing anvil for gauge block calibration, and a removable plastic stablization enclosure which reduces interior temperature fluctuations. Sensitivity of reading is said to exceed three tenths of a millionth of an inch. 1 illustr. *D* *Wbdz*

New automatic X-ray fluorescence spectrometer

J. R. Stansfield. *Hilger J* 1960 Vol 6 (2) pp 23-28 (Apr)

This article describes an instrument, the Hilger Fluroprint, developed to analyse materials rapidly in a flexible routine. Particular aims in designing the instrument were ease in changing from one analytical programme to another, high accuracy and sensitivity, and simplicity in operation. 10 illustr.
D *Wcpz*

Diatest small bore gauge and Omnimex master setting gauge

Michael S. Thompson Ltd, 185 Hammersmith Rd, London W 6. *Machinery, Lond* 1960 Vol 97 (2493) pp 437-438 (Aug 24)

The Diatest bore gauging instrument comprises a probe head to which interchangeable probes can be fitted for checking bores of various diameters from 0.047 in. to 1.5 in. ; the probes actuate the dial indicator through a conical-ended needle. All Diatest equipment can also be used with the principal air gauging systems to provide much finer readings than are possible with the standard dial indicator.

The Omnimex master setting gauge, with measuring range of 0.035 in. to 1.0 in., is also described. 2 illustr.
D *Az Qdz Wb*

The Ebert spectrograph

Jarrell-Ash Co, USA ; Hilger & Watts Ltd, 98 St Pancras Way, London NW 1. *Hilger J* 1960 Vol 6 (2) pp 29-32 (Apr)

The spectrograph is a grating instrument of high definition and excellent resolution and with dispersion, from low to very high, claimed to be suitable for every application. It can be read photographically or fitted with direct-reading heads. 5 illustr, 3 ref.
D *Wcpz*

DAS 1,072,917 **A. W. Ploegsma, NV Philips' Gloeilampenfabrieken**

(June 16, 1953—conv date, Netherlands)

Method of manufacturing gramophone needles of diamond. Verfahren zur Herstellung von Schallplattennadeln aus Diamant

Fig 1 represents a thin-walled tubular drill 2 and a portion of a small diamond 1, *eg* a worn drawing die.

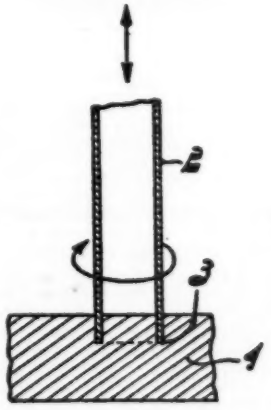


Fig 1. Diagram showing a thin-walled tubular drill 2 and a portion of a small diamond 1. DAS 1,072,917.

The tube 2 is rotated and reciprocated while a suspension of diamond powder in oil is fed to the operating end 3 of tube 2. The tube may have an exterior diameter of 0.5 mm and an interior diameter of 0.35 millimetre. The tubular drill will produce a small cylindrical rod which is then pointed to obtain a record needle. (1 claim, 1 illustr). Ref cited : 1 DBP ; 1 USP. *J* *Nfs Qc.545*

LITERATURE REQUESTS

Please quote the page number of the journal which contains the original reference, and the author and title of the article, in all cases.

HARDNESS AND WEAR TESTING

Industrial standards of accuracy in diamond-pyramid indentation hardness measurement

Anon. *Sheet Metal Ind* 1960 Vol 37 (395) pp 173-183, 202 (Mar)

Second Report of the Testing and Measurement Sub-Committee, Chairman : J. F. Kayser (Inst Sheet Metal Engng).

The first investigation, carried out in 1957, showed that most users of hardness testing machines were unable to determine the hardness of thin metal specimens, 0.02 in. and less, with any approach to accuracy. A second investigation has been made to determine the accuracy with which the impressions are read. Sixty-six firms took part and twenty test blocks, ¼ in. diameter cylinders ½ in. high, were used. One surface was given a micro-polish and three impressions were made on it of approximately 800, 300, and 70 microns. These were prepared by one of the referee laboratories. All results are given and discussed. It was concluded that it is impossible to measure hardness by measuring applied load and diagonal length of indentation to an exact degree. Findings were in agreement with those of Slavina, USSR, who reported that a range of three was to be expected. 4 illustr, 4 tables.

A *Cvd Nde Vfd.2232.255*

Establishing the accuracy and sensitivity of different methods of hardness-testing. Ermittlung der Genauigkeit und Empfindlichkeit verschiedner Haertepruefverfahren

R. Wartmann. *Schweiz Arch angew Wiss* 1960 Vol 26 (7) pp 269-278 (July) (In German)

With a large number of specimens as homogeneous as possible, eight different types of hardness test were carried out on various parts of the surface to be tested. The term precision is defined as the extent to which the process results in a constant numerical value for a constant hardness. Sensitivity, on the other hand, is the degree to which the variations of hardness provoke corresponding variations in numerical value. The results of experiments are shown in tables and formulae. 2 illustr, 11 tables, 1 ref.

A *Cv.21*

The technique of hardness testing and its use as a test in the production of cooper and copper alloys in the form of sheet and strip

V. L. James. *Sheet Metal Ind* 1959 Vol 36 (392) p 819 (Dec) ; 1960 Vol 37 (394) pp 125-135 (Feb)

The second of the two articles discusses the testing of drawn material from cold-worked strip. The relation of hardness to mechanical properties and grain-size, the effect of grain-size and the hardness testing of material which shows pronounced directional properties, and hardness testing at elevated temperatures are also considered. The two appendices give formulae for Brinell and Diamond Pyramid Hardness, and a summary of the researches of E. Meyer (1908) into ball-indentation hardness testing. 29 illustr, 14 tables. See also *Industr Diam Abstr* 1960 Vol 17 p A63 (Mar).

A *Unh.21*

A new method of determining wear on machine parts. Eine neue Methode zur Bestimmung des Verschleisses von Maschinenteilen

M. M. Kruschov. *Wear* 1960 Vol 3 pp 60-71 ; *Schmiertechnik* 1960 Vol 7 (4) p 185 (July-Aug) (Original in English, abstr in German)

A three-sided diamond pyramid or ball indenter is used to measure wear and abrasion on machine parts. A groove in the shape of a rotation hyperboloid indicates wear connections between length and abrasion.

A *Az Cw Nde*

Increasing the precision in measuring the hardness of metals

B. M. Ovsiannikov, L. T. Timoshuk. *Zav lab* 1959 (11) pp 1389-1391 ; *Library of Congress Mthly Index Russ Access* 1960 Vol 13 (4) p 1375 (July) (Original in Russian)

D *Bf Unh Vfd*

Accuracy of Vickers hardness measurement with different loads

A. von den Steinen, W. Schmidt. *Arch Eisenhuettenw* 1960 Vol 31 (1) pp 25-32 ; abstr *J Inst Met* 1960 Vol 88 (10) (June) ; *Metallurg Abstr* 1960 Vol 27 Pt 10 p 684 (June) (Original in German, abstrs in English)

Specimens of various steels, pure iron and pure nickel, were polished mechanically and electrolytically and subjected to Vickers hardness tests with loads of 15 to 10,000 grammes. With decreasing load the hardness increased more steeply with ground than electro-polished surfaces. In the formula $p = ad^n$ (where p = load, d = diagonal of impression, and a is a coefficient) n diminishes with decreasing load. The scatter increases considerably with diminishing load and it is concluded that, in micro-hardness testing, a very large number of impressions must be measured to ensure reliable results.

L *Cvd.21*

Thickness and hardness measurements on gold deposits

G. A. Wilson. *Metal Finish* 1960 Vol 58 (6) pp 50-52 (June)

Methods of measuring the thickness of gold electroplated specimens after grinding and etching, and methods of making hardness tests on similar specimens by diamond pyramid and Knoop indenters are described. The Knoop indenter is satisfactory primarily for cross section measurements where lack of sufficient thickness does not allow the use of the diamond pyramid. Results of measurement are shown in tabulated form. 4 illustr, 1 table.

A *Cvd Nd*

Microhardness of the plagioclase series

A. Mookherjee, K. C. Sahu. *Amer Min* 1960 Vol 45 (5/6) pp 742-744 (May-June)

Application of the indentation micro-hardness technique to mineralogical problems is a comparatively recent undertaking. During routine laboratory work, it was observed that the high reproducibility of results and sensitivity of Leitz 'Durimet' micro-hardness tester, when worked under standard conditions, might be profitably utilized in studying the members of a solid solution series. 1 illustr, 3 ref.

D *Bc Cvdb Wghd*

Hardness tester with accuracy to ±½ point maintained

Northern Mfg & Engng Co, 2500 N Main, Rockford, Ill. *Mach Tool Blue Bk* 1960 Vol 55 (8) pp 204-205 (Aug)

A new portable hardness tester gives direct readings of Rockwell scales. Accuracy is said to be maintained to ±½ point. Weighing only 6½ lb, the machine is designed to be capable of 95% of all laboratory and shop testing. Both Regular Model 3R and Superficial Model 3S are described. 1 illustr.

D *Wgh*

TRUING OF GRINDING WHEELS

Machining processes conference for production executives

Anon. *Pera Bull* 1960 Vol 13 (8) pp 207-208 (Aug)

Among subjects suggested for future research was the comparison of diamond dressing with crush truing.

D *Cg Nj•Cgj*

Crush dressing pays grinding dividends
Anon. *Steel* 1960 p 92 (Feb 29); *Pera Bull* 1960 Vol 13 (6) p 150 (June)

Describes how crush truing can produce components of complicated shape to close tolerances and fine finish.
D *Cgj.21*

Japanese machine tool factories—2
R. E. Green. *Machinery, Lond* 1960 Vol 97 (2494) pp 472-483 (Aug 31)

Describes production methods at Okuma Machinery Works Ltd, the largest machine tool makers in Nagoya. Among the machines mentioned is a plain cylindrical grinder, type GCS, which can be supplied with an automated form wheel truing unit at the rear of the wheelhead for the maintenance of any special form on the 3 in. wide wheel. The unit incorporates a carriage with a slide at a 45° angle which holds the truing diamond at the inner end and a follower stylus at the outer end. Below the outer end is a holder with micrometer adjustment for the template of the form to be trued, against which the follower stylus is pressed by a light spring. 17 illustr.
D *Chcl Pr:Nj Psf|Pr.25.373*

Modern worm gears. Neuzeitliche Schneckengetriebe
Wittmann. *Die Maschine* 1960 Vol 14 (3) pp 20-23 (Mar) (In German)

The form, calculation of geometry, application, preparation, and testing of worm gears are discussed. Conventional thread grinding and milling machines are described, including the diamond truing apparatus for truing both sides of the grinding wheel by means of a template. 13 illustr.
A *Abmd Cgh Nj Psf:Ad Cflk Pr|*
Abmd Cgh Nj Psf:Ad Chcp Pr

New plant and tools
Anon. *Auto Engr* 1960 Vol 50 (5) pp 203-206 (May)

Among the machines described is the 2U-A machine in the Johansson range of cylindrical grinders. The wheelhead will swivel through 360° and can be used at either the right or left of the table for plunge, shoulder, or diameter grinding. A hinged internal grinding attachment may be fitted, suitable for grinding bores from ½ in. diameter upwards. The normal wheelhead may be replaced by a heavy, rigid, internal grinding head if a specially high degree of surface finish is required. Various dressing devices are available, including a profile truing device on which both the diamond and the tracing pin are set at an angle of 25°, so that it is unnecessary to change the position of the diamond, even when truing the radius of a 90° shoulder. The weight of the vertical slide loads the diamond and no pressure is exerted on the diamond slide when in operation.

A portable optical projector may be attached to a variety of machine tools, making possible continuous, precise, magnified checking, direct measurement, and comparison of work contours against transparent overlay charts. The most common applications have been with circular and flat-form tool grinding, production grinding of precision contours, regrinding of tools, and dressing of critical wheel and tool shapes.

Three models of dressing tools specifically developed for use on coated abrasive belts, disks and pneumatic wheels are available, two with flexible-tooth cutters, and one with stiff-tooth cutters. Selection of these tools depends upon the grain size of the coated abrasive to be treated. The tools are suitable for wet or dry applications. 9 illustr.
L *Ab Cg Nj Psf*

Crankpin grinding machine
Norton Co, Worcester 6, Mass. *Grinding & Finishing* 1960 Vol 6 (9) p 24 (Sep)

The Norton Type CC-8 Crank-O-Matic was shown at the Chicago Exposition arranged to grind six crankpin diameters, and set-up as part of a production line together with Type CM-2 Multi-Wheel grinder and a No 31 Crank-O-Lap lapping machine. Several features are said to ensure consistent duplication of ground crankpin surfaces within close tolerances for roundness, diameter, shoulder width, and fillet radii. 'Straddle Bearing' mounting of the grinding wheel spindle eliminates spindle deflection under load. Another significant feature is the continuous path truing of the wheel face and radii. Results are said to have shown the effectiveness of this device in contributing towards high quality of the finished work. A version of the machine, designed for fully automatic operation, is called the No 2 Unitized Crank Pin Grinding Machine. 1 illustr.
D *Agn Chc Pr*

Plunge grinding machine
Norton Co, Worcester 6, Mass. *Grinding & Finishing* 1960 Vol 6 (9) pp 25-26 (Sep)

The Norton CP-1 Plunge-O-Matic plunge grinding machine represents a building block approach to high production automatic plunge grinding, and was designed from the beginning to incorporate a semi-standard turret type automatic loader. It is said to be possible to change over to other plunge grinding work with less expense than previously. The speed of the wheel face is maintained at a constant rate even as the diameter is reduced. The variable-speed wheel drive motor is controlled automatically by the action of the diamond-carrying ram of the truing device. As the diamond advances to true the wheel, a rheostat is automatically actuated to increase the wheel spindle revs/minute. The speed at which the truing diamond traverses to dress an angled wheel is the same on each side of the wheel and in both directions. The angle of the 'vertical' slide can be adjusted to suit the conditions of the job. The constant speed of the diamond improves the finish obtainable on the work.
D *Chcd Pr:Nj Psf*

Jones & Lamson type E-2 automatic form grinder
Buck & Hickman Ltd, Otterspool Way, By-Pass, Watford. *Machinery, Lond* 1960 Vol 97 (2493) pp 441-442 (Aug 24)

This fully automatic machine is for form grinding operations, by the plunge-cut method, on cylindrical parts up to 31 in. long. It can also be used for other grinding jobs on parts held between centres or in a chuck, or which are supported at the periphery in a shoe-type fixture. Wheel dressing may be done by the Perpetual Form Control system which uses diamond impregnated disk-shaped dressers mounted on a horizontal shaft at the rear of the grinding spindle. Dressing procedure is outlined. 2 illustr.
D *Chcb Pr:Nj Psf*

News of the industry
Habit Diamond Tooling Ltd, Lurgan Ave, London W 6. *Machinery, Lond* 1960 Vol 97 (2492) pp 405-407 (Aug 17)

The Habit Tally-Form enables the operator to produce a dressed face and two corner radii on the working surface of a grinding wheel in one continuous movement of the dressing diamond from a pre-determined setting. The dressing action is claimed to produce a truly tangential blending of the arcuate and straight portions of the wheel, thus eliminating the tendency to leave witness lines. The attachment is intended particularly for dressing wheels such as those used for grinding crankshaft journals and stub axles, for which accurately shaped and blended fillet radii are specified.
D *Ab Cgh Nj Psfc*

USP 2,919,689 (Oct 4, 1956) **E. J. Burkhart**
Radius dresser

Fig 2 and 3 show the vertically adjustable diamond holder 20 on shoe 17 to be fixed by a set screw in any

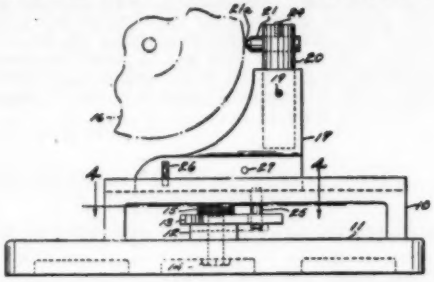
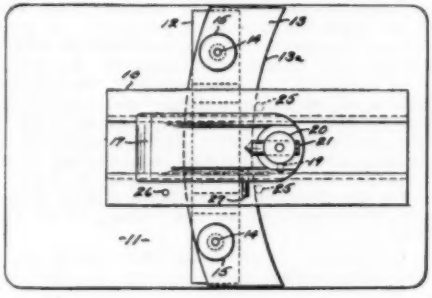


Fig 2 (above) and 3. Diamond holder 20, vertically adjustable in any convenient position, is shown on shoe 17. USP 2,919,689.



convenient position. 13 is a template on bed plate 11. The position chosen for fixing shoe 17 is dependent on the distance between pin 26 in base 10 and pin 27 in shoe 17 which serve as reference points and are set by inserting a gauge block of appropriate size between the pins. This design is made for a gauge block of 1 in., point 21a being exactly above the line between follower pins 25. When these are brought into contact with face 13a and base 10 is moved to the right or left with the pins remaining in contact with 13a, tool 21 will travel through a segment of a curve equivalent to the curvature of template face 13a. If pin 27 is moved to within one-half inch of pin 26 using a ½ in. gauge block and shoe 17 fixed in this new position, then tool 21 will finish a wheel having a radius one-half inch less than the radius of the template. (4 claims, 5 illustr). Ref cited : 7 USP.

J *Ab Cg Psfc.545*

FP 1,202,526 **R. Habib, Hawerk AG**
(Sep 11, 1957—conv date, Switzerland)
Device for eroding a metallic workpiece by electric current. Dispositif pour éroder une pièce métallique par voie électrique

The characteristic feature is the arrangement for forming or truing the profile of a rotary electrode with great precision without removing the electrode, displacing the tool to be sharpened, or readjusting the machine controls. The arrangement consists of a pantograph with feeler and truing point, the feeler being guided by hand along a template or a drawing. The mechanism is mounted on a fixed column on a table and can be pivoted around a vertical axis of this column. (10 claims, 5 illustr).

J *At Bf Ceg Qs.545*

USP 2,921,485 (Feb 25, 1958) **L. Small, Service Diamond Tool**
Method of forming a diamond tool

Refers to the production of truing tools with two diamonds following one another in exactly the same path when applied to a grinding wheel. In conventional truing operations, the total cut in a single pass is about 0.001 inch. By using two diamonds in the same track, a cut of 0.0005 in. only is required. This materially reduces the wear on the diamond because of better cooling and less strain, while a better wheel surface is obtained because of the elimination of crushing which occurs if larger cuts are taken resulting in glazing of the wheel. The diamonds are mounted in a holder so that their cutting tips project approximately the same distance. The holder is then placed in a fixture which is positioned adjacent to a microscope of the type having intersecting cross hairs, so as to put the silhouettes of the tips in optical registry with one cross hair and at equal distances on opposite sides of the other cross hair. The tool holder is then machined in directions at right angles to the one cross hair while held in the fixture. (2 claims, 8 illustr). Ref cited : 3 USP.

J *Fc Lb Nj.545*

USP 2,922,413 **K. H. Schultze, Herbert Lindner GmbH**
(July 19, 1958—conv date, Germany)
Truing device for profile grinding wheels

The truing device uses a template that can be cheaply manufactured and simply exchanged to produce, in

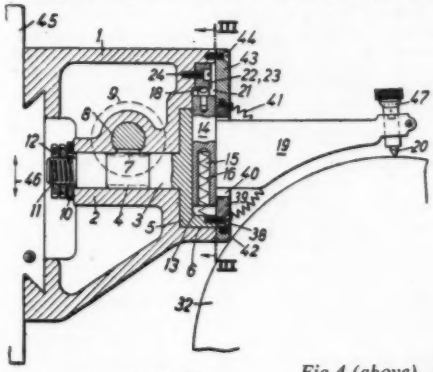


Fig 4 (above). Diagram showing action of diamond 20 on arm 19 in swivel head 15. USP 2,922,413.

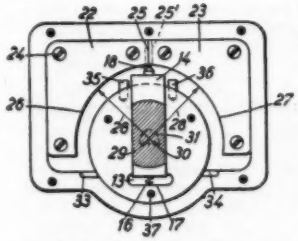


Fig 5 (left). Arc-shaped templates 22 and 23 in contact at 25. USP 2,922,413.

particular, arch profiles on grinding wheels, *eg* for grinding helical grooves in ball rotary systems. Fig 4 illustrates the arrangement of diamond 20 on arm 19 in swivel head 15, whose shaft 3 is provided with pinion-like toothing 4 turned by rack 7 on driving rod 8 actuated by hydraulic piston 9. Templates 22, 23 are attached to casing 1 and feeler or contacting roller edge 18 pressed upwards by spring 16. The arc-shaped templates 22 and 23 are shown in Fig 5 contacting each other at 25. 41 is a bellows to prevent impurities from entering from outside. (9 claims, 8 illustr). Ref cited : 1 USP ; 1 BP ; 1 GP.

J *Abm Cgf Nj Psf.545*

FP 1,204,699 **L. H. Metzger, H. C. Miller, Super-Cut Inc**

(June 10, 1957—conv date, USA)

Method and device for truing grinding wheels. Procédé et appareil pour le dressage de meules

Until now the truing diamond has been turned when already too worn to present its abrasion-resistant face to the wheel. It is customary to incline the cubic plane of the diamond at an angle of 15° to a plane through the axis of the grinding wheel, obtaining a negative rake angle. Comparatively large diamonds are required and not more than about 20% of the structure can be utilized. In the new device, the diamond is always orientated so that its (110) direction is parallel to the direction of abrasion. Fig 6, 7 and 8 represent the essential portion of the device as seen from above, the side, and the front. The diamond holder 12 is set in its middle position or turned to the right or left around pivot 32 and fixed by bolt 46 in holes 38, 40 or 42. Fig 9, 10, 11 together with Fig 12 show the kind of wear which occurs in the three continuously repeated settings. The displacement angle is about 18 degrees. (12 claims, 11 illustr).

J *Ab Cg Nf Psf.545*

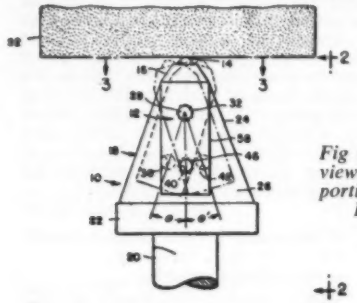
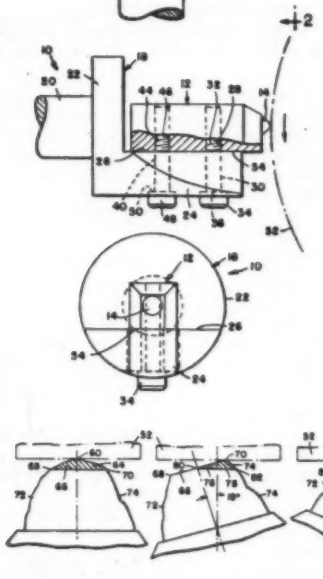


Fig 6-8 (left). Three views of the essential portion of the device FP 1,204,699.



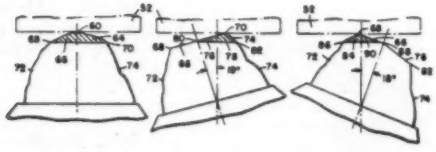
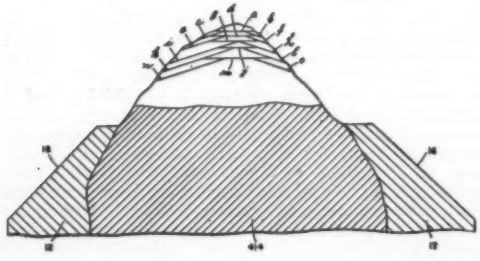


Fig 9-11 (above) and 12 (below). Illustrations of the kind of wear which occurs in the three continuously repeated settings. FP 1,204,699.



PRECISION MACHINING OF METALS

Machining cobalt alloys—I, II, III

C. T. Olofson, F. R. Morral (Battelle Mem Inst). *Amer Mach* 1960 Vol 104 (11) pp 103, 105, 107 (May 30)

Cobalt imparts high strength at high temperatures to certain high speed and hot working tool steels, and it is also an important component of some 'super alloys' used for high temperature applications. In general, minimum requirments for machining cobalt steels and alloys are high quality machine tools, sharp cutting tools of appropriate designs and materials, low speeds and feeds, a continuous cutting action, and intimate cooling by properly selected fluids. Drilling is the most difficult operation to perform. Drills should be as short as possible and of heavy duty design; they must be kept sharp and a positive feed is essential. Tables are given for the chemical compositions, drilling data, and milling, broaching, reaming and shaping of the alloys. 3 tables.

See also *Industr Diam Abstr* 1960 Vol 17 p A187 (Aug); p A243 (Oct). *L* *Bfxz Ceq.21*

Machining cobalt alloys—IV, V, VI

Anon. *Amer Mach* 1960 Vol 104 (12) pp 149, 151, 153 (June 13)

Turning and facing, the easiest machining operations to perform on the cobalt-containing alloys, should be done with HSS, non-ferrous cast alloy, and carbide tools. Other recommendations are made and advice is given on tapping. 4 tables.

D *Bfxz Ceq*

Ultra-high-tensile steels

L. L. Arundel, R. Kitchingham. *Aircr Prod, Lond* 1960 Vol 22 (5) pp 176-186 (May)

Experimental work in the machining of high tensile steel by routing, high speed milling and conventional milling, used carbon-dioxide as coolant. Special cutters were developed. The aim was to ascertain the machinability of a selected material with a tensile strength of 120 tons/sq. in. and to obtain data on the use of carbon-dioxide as a coolant. 27 illustr.

A *Bfdz Ceq*

Developments in high speed machining

R. N. Cook (Wimet Div, Wickman Ltd). *Engineering, Lond* 1960 Vol 190 (4916) pp 63-64 (July 8)

Metal cutting speeds can be divided into three groups according to the tool materials and cutting method: up to 1,000 ft/min, as usually associated with tungsten carbide tooling; 1,000 to 30,000 ft/min, as associated with alloys of high titanium carbide content and with sintered oxide; and ultra-high speeds up to 360,000 ft/min using static HSS tools with the workpiece explosively propelled past the cutting edge. The three groups are analyzed. 1 illustr, 1 ref.

A *Bf Ceg Uqfb*

Machining Nimonic

Henry Wiggin & Co Ltd. *Aircr Prod, Lond* 1960 Vol 22 (6) pp 256-259 (June); (7) pp 275-279 (July)

In the first article, recommendations are made concerning tool geometry and machining conditions for high speed tool steels and carbide tipped tools. In the second, the processes of grinding, honing, reaming, milling, drilling and broaching are discussed. Aluminium oxide grinding wheels are recommended in different grits and densities according to the type of work to be done. 11 illustr, 6 tables.

A *Pd.21*

Profile milling titanium and its alloys

C. T. Olofson. AD-220195; PB 161 175; DMIC Memo 1959, 4 pp (July 10); *Battelle Tech Rev—Abstr* 1960 Vol 9 (7) p 19 (July)

Profile milling is a method of milling in which the path of a single spindle cutter is guided and controlled by a stylus tracing a master form or a template made to the contour, shape, or pattern to be reproduced on the workpiece. When profile milling titanium and its alloys, vibrations must be held to an absolute minimum.

D *Bfn Cffz/Bfxn Cffz*

Machining titanium

Short Bros & Marland Ltd, Belfast. *Aircr Prod, Lond* 1960 Vol 22 (4) pp 136-144 (Apr)

The results of a limited programme of research into the machining of titanium alloy with tungsten carbide and HSS tools are discussed. Included are the influence of tool geometry and cutting fluids on the performance of face mills, end mills, slitting saws, twist drills, and taps. 21 illustr.

A *Bfn Ceq Pdb/Bfn Ceq Pdc*

Have gun drill . . . will travel

Douglas Aircraft, Torrance, Calif. *Amer Mach* 1960 Vol 104 (11) p 93 (May 30)

The gun drill has long been considered an immovable object but now portable gun drills are available, primarily for producing relatively short holes that must be straight and true and within tolerances of 0.0005 inch. Holes can be made in the components of an assembly when they are needed and not before, while stationary gun drills are reserved mostly for accurate drilling of deep holes. As it has a carbide cutting edge operating in a confined space filled with cutting oil, the gun drill can machine difficult materials which cannot ordinarily be handled successfully with conventional drills. 2 illustr.

L *Cfbn Pl*

A simple centering jig and goniometer for punching or drilling spheres for structure models

D. K. Smith (National Bureau of Standards). *Amer Min* 1960 Vol 45 (5/6) pp 717-725 (May-June)

Two devices are used in drilling the spheres in any desired co-ordination. The centring jig is used to drill the first hole through the centre of the sphere. Then the goniometer locates a second hole related to the first by a known bond angle. For all succeeding holes, the goniometer essentially guides the drill or punch along that radius of the sphere which makes the desired angles with two previously located radii. 5 illustr, 9 ref.

D *Az Cfb Pu/Az Cfb Wbg*

Ceramic or carbide tools—which ?

D. R. Kibbey, H. D. Moore. *Metalworking Prod* 1960 Vol 104 (33) pp 62-63 (Aug 17)

Research at Ohio Univ resulted in the conclusion that ceramic tools are preferable for turning speeds 800 to 900 surface ft/min, and carbides for lower speeds. Qualifying factors are recorded. 1 illustr, 1 table.

D *Ceqb Pdc*Ceqb Pdd*

Cutting tools need the best in tool holders and machine tools

D. G. Jones. *Mach Tool Blue Bk* 1960 Vol 55 (8) pp 95, 98 (Aug)

D *Pd Pr*

The machining of ultra-high-tensile steels with CO_2 as a coolant

Morfax Ltd, Willow Lane, Mitcham, Surrey. *Machinery, Lond* 1960 Vol 97 (2492) pp 360-371 (Aug 17)

15 illustr. *D* *Bfdz Ceq Sj*

The case for throw-away tips

Anon. *Metalworking Prod* 1960 Vol 104 (34) pp 52-54 (Aug 24)

Statistical information on the case for using throwaway tips, as against brazed tips, can be gained from the results of tests undertaken by the Sandvik Steelworks Co Ltd of Sweden, on their T-MAX throw-away holder and Coromant brazed tools. 8 illustr.

D *Pdcb*

Machining thin discs

H. J. Pearson. *Aircr Prod, Lond* 1960 Vol 22 (7) pp 244-254 (July); (8) pp 304-312 (Aug)

Part I describes developments at Rolls Royce Ltd, Derby, which led to the manufacture of a special Duplex-Slide Lathe for machining thin disks with carbide tipped tools. The second article describes the developments in balanced contour turning at Rolls Royce, and the production of a second machine, known as the Heyligenstaedt DPK 750, a double-sided face-copying lathe designed and built to the company's requirements. Carbide tipped cutting tools are used at a constant cutting speed with this lathe. 27 illustr.

A *Az Ceq Pr*

Effect of metalworking lubricants on surface smoothness and precision of machining holes

I. S. Terent'ev. *Trudy LTA* 1959 (83) pp 173-176; *Library of Congress Mthly Index Russ Access* 1960 Vol 13 (4) p 1374 (July) (Original in Russian)

D *Bf Ceq Sk.21*

Built-in diamond turner

Cleveland Industrial Tool Co, Chardon, Ohio. *Tooling & Prod* 1960 Vol 26 (4) p 114 (July)

Useable diamond life is extended up to four times by use of the Turnable diamond tool, it is said. It has a built-in turner head which provides proper diamond turning without need for re-positioning the tool. 1 illustr.

D *Nf Uqe*

Programme-controlled machine tools

Anon. *Mach Tool Rev* 1960 Vol 48 (286) pp 95-103 (July-Aug)

A general survey of the subject, followed by reviews of programme-controlled machine tools developed by Alfred Herbert Ltd and by those British machine tool makers for whom the company act as sole agents. 15 illustr.

D *Pr Wpz*

Multiple-head drilling machine can process five sides of workpiece in one work cycle

Wisconsin Drill Head Co, Butler, Wis. *Amer Mach* 1960 Vol 104 (11) p 115 (May 30)

The Wis-Matic multiple-head drilling machine is capable of drilling, tapping, boring, reaming and spot-facing. It is available with any combination of one to four horizontal and one vertical power unit. All power units are adjustable and can be run independently of each other. Specifications are given. 1 illustr.

L *Cfb Pr Psz*

Versatile new jig boring/milling machine

Special Machine Div, George Gorton Machine Co. *Tooling & Prod* 1960 Vol 26 (5) p 52 (Aug)

Large capacity and versatility of the new Gorton jig boring/milling machine, combined with its precision drilling and boring capabilities, are said to facilitate new model work and other limited operations and to reduce materially the time needed to produce prototypes, tooling plates, templates, et cetera. Vernac optical units simplify hole location to within ±0.0005 in. limits on the 36 × 54 in. table. Other features are described. *D* *Az Cfd Pr|Az Cff Pr*

Twin-headed automatic lathe

Usines Tornos, Montier, Bern; British rep: E. M. Vaughan Ltd, Coventry. *New Scientist* 1960 Vol 8 (193) p 288 (July 28)

A new lathe, the Vice-Versa, consists of two sliding head automatic machines mounted on a single base and having a common drive. Automatic transfer equipment delivers the partially machined workpiece from one unit to the other for machining the other end, there being no need for turning the workpiece round during the transfer. *L* *Ceqb Pr*

Instrument lathe

Ideal Machine Tool & Engng Co Ltd, 282 Kingsland Rd, London E 8. *Mach Lloyd* 1960 Vol 32 (16A) p 37 (Aug 6)

The 'Ime' universal precision instrument and toolmakers' lathe is claimed to be suitable for turning, drilling, milling (with dividing and gear-cutting attachment), external and internal grinding, and second operations. It is available with either a 20 in. or a 24 in. long bed, and has a centre height of 3 inches. The distance between centres is 12 in. with the 20 in. bed, and 16 in. with the 24 in. bed. 1 illustr.
D *Ceqb Pr Psc Qc W*

Holes drilled from solid to 20″ deep

Ex-Cell-O Corp, Detroit. *Mach Tool Blue Bk* 1960 Vol 55 (8) pp 156-157 (Aug)

The Ex-Cell-O Bor-Drilling process, originated a few years ago, is a highly developed precision operation for producing deep holes in volume directly from the solid in almost any material. Application of the process to drilling a 11/16 in. diameter, 20½ in. deep hole, in one pass, is described. 1 illustr. *D* *Cfbz*

Chooses correct tool by the numbers

Lucas Machine Div, New Britain Machine Co. *Prod Engng* 1960 Vol 31 (31) p 18 (Aug 1)

A machine tool designed to automate small lot production, the Versatronic has a bank which holds fourteen tools, and mounting room for six such banks which gives it total capacity of 84 tools. Numerical control changes the tools, enabling a variety of operations on the same part to tolerances of 0.0002 inch. 1 illustr. *D* *Pel Wpz:Prs*

Coventry pre-set tool unit

Anon. *Mach Tool Rev* 1960 Vol 48 (286) pp 112-114 (July-Aug)

The technique provided by the Coventry Pre-set Tool Unit permits an unskilled operator to replace worn or chipped tools without recourse to the setter. The pre-set tools, which are merely modified standard lathe tools, are ground on the top and bottom faces to ensure accurate seating and have three holes drilled and tapped in the shank into which are fitted three square-headed, self-binding adjusting screws. The unit is adaptable to most types of lathes and automatics using shank-type tools. 5 illustr.
D *Pd Psc:Pr*

14 tools in one

R & L Tools, 1825 Bristol St, Philadelphia 40. *Mach Tool Blue Bk* 1960 Vol 55 (8) p 239 (Aug)

The R and L turning tool, designed for turret lathe or screw machine operations, is said to duplicate the operations of fourteen separate tools at a reported cost saving of over 500 per cent. Various uses are described. Turning and drilling combinations and other operations are possible. Standard size shanks as well as other sizes can be supplied. 1 illustr.
D *Ceqb Pr:Pd*

Dry lubricant stick lubricates cutting tools

Alpha-Molykote Corp, 65 Harvard Ave, Stamford, Conn. *Mach Tool Blue Bk* 1960 Vol 55 (8) p 256 (Aug)

Extreme pressure molybdenum disulfide dry lubricant in stick form is resin bonded for greater strength. The Molykote lubricating stick permits easy application of a lubricating film to cutting tools, sliding surfaces, and precision mechanisms. With proper application, the life of the cutting tool is said to be doubled frequently. 1 illustr. *D* *Pd Qr Skz*

Lathe carrier

Ratby Engineering Co Ltd, Nr Earl Shilton, Leicester. *Tooling* 1960 Vol 14 (9) p 74 (Sep)

A recently developed type of lathe carrier has been specially designed to save time and eliminate wasted effort on grinding and turning operations. Extensive tests are said to have proved that due to its four-point clamping arrangement, the carrier does not damage component parts or slip under heavy cutting loads. 1 illustr. *D* *Ceqb Pr*

Hauser co-ordinate boring machines. Hauser Koordinaten-Bohrmaschinen

Henri Hauser, Bienne, Switzerland. *Von Werkzeugen u Werkzeugmaschinen* 1960 (18) pp 10-13 (Aug) (In German)

7 illustr. *A* *Cfd Pr*

Numerical control without numbers

Warner & Swasey. *Prod Engng* 1960 Vol 31 (24) p 21 (June 13)

A new numerically controlled turret lathe includes its own electronic memory designed to store and recall the sequence of commands from any machining cycle and to put the various feeds and motions into action automatically. The automatic control mode of operation needs no outside programming. There is provision for arranging individual commands as tool wear or some other variable calls for modification, and corrections of 0.0005 in. in the horizontal and 0.00025 in. in the cross direction can be made. A method of making contour cuts is also included in the control register. 2 illustr. *D* *Ceqb Pr Wp*

USP 2,914,892 (Dec 18, 1957) **E. Fouquet**

Process and arrangements for simultaneous lubrication and cooling of the piece of work and the cutting tools during machining operations

(10 claims, 6 illustr). Ref cited: 7 USP; 1 Swiss P.
D *Az Ceq Pd Qs.545*

REQUESTS FROM AMERICA

American readers who wish to order a photostat or reprint of an article abstracted in Industrial Diamond Abstracts are advised to apply directly to the appropriate journal if this is an American publication.

Swiss P 343,310 (Dec 9, 1957) **R. Arnoux**
Enamel dial and method of manufacture. Cadran émail et procédé de fabrication de ce cadran

It has been impossible until now to fix hour signs on an enamel dial. Such dials are 0.7 to 0.75 mm thick and the holes for fixing the signs have to be 0.2 millimetres. The only usable tools have been diamonds and it is doubtful if a cylindrical hole 0.7 to 0.75 mm long could be made. However, if a conical recess is made in the hard upper layer of the dial using a pyramid-shaped diamond, the hole proper can then be drilled with a steel drill and cylindrical holes can be produced without difficulty to receive hour signs. (9 claims, 3 illustr). *J* *Az Bmk Cfb Nh.545*

CUTTING AND MACHINING OF STONE, GLASS, ETC.

Absorption of ultra-violet and visible light by ultra-thin sections of vitrinite from a high-volatile bituminous coal

S. Ergun, J. T. McCartney, R. E. Walline. *Nature, Lond* 1960 Vol 187 (4742) pp 1014-1015 (Sep 17)

A detailed study of absorption was made possible when the authors succeeded in cutting ultra-thin sections of coals and in accurately determining their thickness and refractive index by interferometry. The ultra-thin sections of vitrinites were obtained by cutting on a microtome using a diamond knife. The fragments were very small, the areas suitable for accurate absorption measurements usually being less than 800 μ in diameter. The measurement technique is described and conclusions recorded. 2 illustr, 7 ref.
D *Az Bn Ceg Nfn*

The ' Ultramicrotome '—an instrument for cutting ultra-thin sections

Anon. *RCI Standard* 1960 (5) p 6 (June)

In the conventional method of section cutting in which the section moves along guides, reproductivity is limited principally by the thickness of the oil film between moving surfaces and by the method of cutting, by hand or motor. The Philips Ultramicrotome is claimed to overcome this problem in a novel way by utilizing the properties of magnetostriction and thermal expansion to retract and advance the specimen in relation to the knife. The operating principle is described and illustrated. Either steel or glass knives may be used. 3 illustr. *D* *Ceg Pdm*

Production of islands and dice in semi-conductor slices with an ultrasonic drill

R. D. Knight. *J sci Instrum* 1960 Vol 37 (8) pp 263-265 (Aug)

Describes the production of islands of less than 0.002 in. diameter with an ultrasonic drill and the tools and additions made to the equipment to achieve the degree of accuracy required. A novel feature is a frictionless gauge to indicate depth and rate of cutting. Also described is a method of bulk dicing and bulk islanding by the use of laminated tools. Each of these tools has a protruding ' pilot-blade ' to locate the work so that dicing can be correctly related to islanding and/or to any strip plating, markings, *etc.* put on the slice in earlier operations. A novel self-aligning work table, essential to the bulk islanding process, ensures that the exposed face of the semi-conductor slice is in intimate contact with the tool face. 5 illustr, 1 ref.
D *Az Bde Ceqr Pd*

Chrysotile morphology

M. Maser, R. V. Rice, H. P. Klug (Mellon Institute). *Amer Min* 1960 Vol 45 (5/6) pp 680-688 (May-June)

Attempts to cut thin cross sections of chrysotile with glass knives proved unsatisfactory, but the use of a diamond knife enabled sections to be cut thin enough to demonstrate details within the predominately circular cross sections. The knife was mounted on a Servall Porter-Blum ultramicrotome. The authors conclude that this investigation, though not completed, demonstrates the value of ultramicrotomy of relatively hard materials utilizing a diamond knife and an epoxy resin, ' Araldite ', embedding. It should be noted that Fernandez-Moran has published micrographs of sections of metals using a diamond knife. 3 illustr, 13 ref. *D* *Az Bcm Ceg Nfn*

Diamonds smooth roads

Anon. *Aust Civil Engng* 1960 Vol 1 (4) p 50 (Jan 4)

Diamond blades have proved an economical method of removing irregularities from concrete pavements in the construction of roads and airfield runways in the United States. Metal bonded blades with natural diamond powder of relatively large sieve sizes were developed, a series being mounted on a common axle for the work. Investigations are being made into the use of diamond blades to smooth off old paved roads with corrugated surfaces.
A *Az Chmz Pdz Urb*

Do's and don'ts for fabricating laminates

J. E. Martin. *Mod Plast* 1960 Vol 37 (6) pp 116, 118, 121-122, 124, 188, 190, 192 (Apr)

The different processes in machining laminates are examined. For circular sawing paper and cloth laminates, both steel and carbide tipped saws are recommended, the latter giving up to fifty times as long service as steel. Glass-reinforced laminates require carbide tipped or diamond tools, as the glass acts as an abrasive on steel tools. Wet systems are most satisfactory. For circular sawing, a diamond impregnated steel wheel is the only satisfactory tool, operating best at speeds of 5,000 to 10,000 surface ft/minute. Diamond impregnated steel bands should be used for band sawing, but carbide tipped tools are suitable for milling, turning, and drilling. 4 illustr, 4 tables.
A *Bpr Ceq N*

Features of the process of grinding certain crystalline materials

N. N. Kachalov, L. F. Grigor'eva. *Inzh fiz zhur* 1960 (1) pp 35-40 (Jan); *Library of Congress Mthly Index Russ Access* 1960 Vol 13 (4) p 1288 (July) (Original in Russian, abstr in English)
D *Bd Chc.132*

Donut-shaped cutter slices friable material

DoAll Co, Des Plaines, Ill. *Prod Engng* 1960 Vol 31 (34) p 16 (Aug 22)

The cutting wheel, 0.006 to 0.010 in. thick, should reduce scrap loss by 50% and yield more wafer ingot, manufacturers claim. Peripheral saw wheels are 2 to 3 times thicker than the cutting wheel. The principle emploved is that of stretching a thin metal membrane radially until it is perfectly flat, rigid, and true running. Because this membrane, the cutting wheel, is held accurately and stretched radially by a peripheral chuck mounting, it can be much thinner than peripheral-type sawing wheels. The cutting edge of the wheel is diamond impregnated. The crystal to be sliced is positioned through the inner opening and automatically sliced. 1 illustr. *D* *Az Bz Ceg Nt*

Diamond bits

J. K. Smit & Sons. *Rds & Str* 1960 Vol 103 (3) p 170 (Mar)

A new line of tubular Thin Wall Diamond Bits has been developed for holing through materials such as reinforced concrete. The bits are made in standard diameters from 1/14 in. to 14 in. and in core lengths of 4½ in., 12 in., and 18 inches. Three types are made: whole diamond first quality resettable; impregnated, with cutting diamond particles in a tough bonded matrix; and whole diamond second quality throwaway bits. 1 illustr. *A* *Bny Cfb Nhbz*

Edge grinder

Murray-Way Corp, PO Box 180, Birmingham, Mich. *Mod Plast* 1960 Vol 37 (10) p 54 (June)

The machine can be used for high production squaring and finishing of vinyl floor tile, laminates, and similar plastic products. Blocks of the material or the work-piece are passed between the two oscillating abrasive belts, index, and then return. Finish depends on the type of belt used, and the machine may be ordered to fit any width of belt.
A *Bp Chcs Pr*

Slicing of semi-conductors

Semi-conductor Div, Sylvania Electric Products Inc, Woburn, Mass. *Ceramic Age* 1960 Vol 75 (4) p 73 (Apr)

A fully automatic slicing machine manufactured by Fitchburg Engineering Co has been found to eliminate surface imperfections in the wafers obtained, which can now be cut from 0.025 in. down to 0.007 in. ±0.0005 inch. Diamond wheels, 0.018 to 0.020 in. thickness, are used with a spindle speed which is infinitely variable from extremely low speeds to a maximum of 9,200 rev/minute. Rigidity and precision of wheel mounting has reduced replacement of diamond wheels by 75 per cent. 1 illustr. *A* *Ag Bde Cej Nv*

Speedlap Corporation

Speedlap Corp, 8022 N Monticello, Skokie, Ill. *Grinding & Finishing* 1960 Vol 6 (9) p 84 (Sep)

The new Microsize Unit gives guaranteed repeatability in the lap sizing of germanium or silicon wafers to 0.005 ± 0.0001 in. with parallelism to 0.0001 inch. Production rates of 300 silicon or 400 germanium 1 in. diameter wafers/h are said to be easily obtainable. The unit works in conjunction with a standard 18 in. Speedlap lapping machine.
D *Az Bfr Cegc Pr/Az Bhc Cegc Pr*

GEM POLISHING

Diamond cutting in South Africa

Anon. *Gemmologist* 1960 Vol 29 (347) p 102 (June)

The Chairman of the South African Diamond Cutters' Association expressed concern that so few apprentices were being trained, thus threatening the industry with eventual collapse.

For several months, small diamonds, cut and polished in Israel, have been imported and it seems likely that the local manufacturing jewellery industry will continue this policy. South African jewellers estimate that nine-tenths of the world production of gem diamonds are cut and polished in Holland and Israel, where labour costs are much lower than in South Africa.
D *F Hp.25.361*

Diamond Standards Committee report

Anon. *Guilds* 1960 Vol 15 (5) pp 2, 11 (May)

The purpose of the Committee, working with the Gemological Institute of America, is to create uniform terminology for diamond quality: cutting, colour, and clarity will be graded on a scale of '0' to '10'. The publication of an indexed book, which may comprise the entire diamond grading system and be of use in laboratory work, is being considered.
L *F.255:.2232.232*

FP 1,202,958 **Industrial Distributors (1946) Ltd**
(Mar 20; Apr 5, 1957—conv date, South Africa)
Method and device for eroding crystalline carbon such as diamond. Procédé et dispositif pour éroder du carbone cristallisé pur, tel que du diamant

It has not been possible hitherto to use any electro-erosive method for sawing or drilling diamond without combining it with mechanical abrasion. The new method comprises two steps: a graphitizing step in which at least part of the surface is graphitized, and the actual eroding step in which sparks are produced between an electrode and the body of the diamond while the electrode is moved in the desired direction. The graphitizing step is illustrated in Fig 13. The

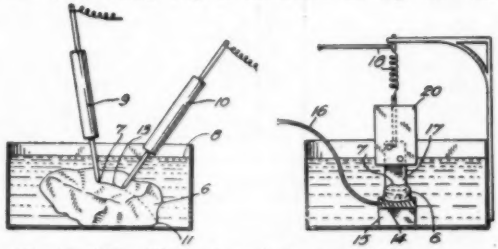


Fig 13 (left). Illustration of the graphitizing step.
Fig 14 (right). A device for sawing a diamond with a leaf electrode 17. FP 1,202,958.

diamond 6 is immersed in a dielectric liquid 8 (paraffin oil). Two needle electrodes 9 and 10, spaced about ¼ mm apart, contact the diamond. By a tension of 10,000 V between the electrodes, a line 13 is graphitized, and, by moving the electrodes, a line 11 may be burned around the stone. The second step is to establish contact between the electrodes and this line, while one of the slightly charged electrodes is moved in the direction in which erosion can take place between it and the diamond. It has been found in practice that the whole surface should be graphitized: a non-oxidizing oxy-acetylene flame is used for this purpose, and the resistance of the diamond surface will then be about 100 ohms. Fig 14 shows a device for sawing a diamond by means of a leaf electrode 17 loaded by weight 20 using a tension of 2,000 to 6,000 volts. A diamond 6.4 mm wide and 0.6 mm thick could be severed along a cleavage plane in less than 15 minutes. A diamond of the same size but 2.5 mm thick could be sawn into two parts along a cleavage plane in 2½ hours. (21 claims, 9 illustr).
J *F Hp.545*

DIAMOND TECHNOLOGY

First published 1942 as "Production Methods for Diamond and Gemstone." The second edition of this book by P. Grodzinski has been revised throughout and considerably enlarged. 840 pages, 486 illustrations, 94 tables, and indexes. From NAG Press Ltd., 226 Latymer Court, London W 6. 55s 0d, post free.

Swiss P 342,862 (Mar 1, 1956) **W. Staehli**
Machine for the table of jewels. Maschine zur Bearbeitung der Tafel von Edelsteinen

The machine is characterized by a number of holders which may be individually attached and detached from a support. The holding pins are guided at right angles to the rotating scaife with an individual stop for each pin and individual means for adjusting the grinding pressure. Fig 15 and 16 are elevation and plan of the machine with twenty-two holders H on supporting bars 32. The scaife 13a in bowl 12 swings around shaft 5 under the holders when eccentric 23 rolls on roller 28 : the lever is then set to the left. 17 is the electric motor driving the scaife and spindle 22 through transmission 21 to obtain a slow swinging movement. Fig 17 shows the arrangement of the holders in their supporting bars with jewels E. (4 claims, 4 illustr).

J *Bb Ceq Tg.545*

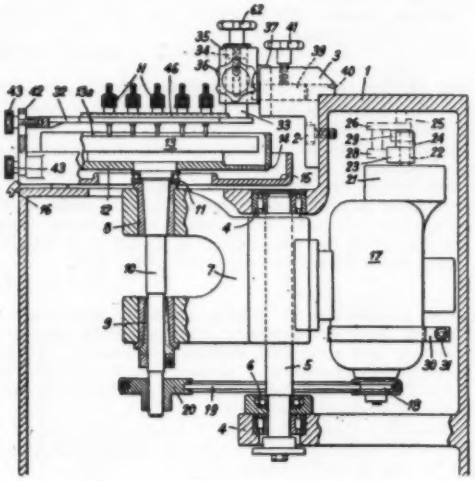


Fig 15 (above) and 16 (below). Elevation and plan of the machine showing holders H on bars 32. Swiss P 342,862.

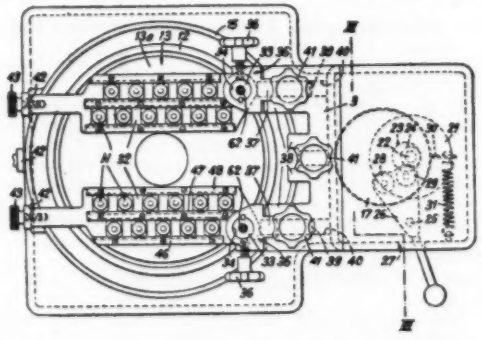
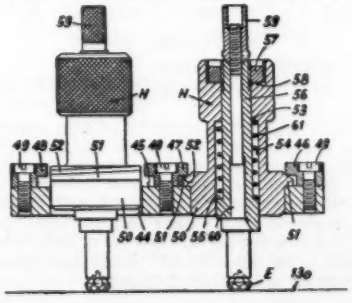


Fig 17 (below). Holders arranged in their supporting bars with jewels E. Swiss P 342,862.



ROCK DRILLING

World's deepest ultra-slim hole in ultra-hot

F. Newlin, J. E. Kastrop. *Petrol Engr* 1960 Vol 32 (5) pp B19-B26 (May)

A successful drilling operation in which the last run entailed use of a 3¼ in. custom-made diamond bit, and the stretch of hole from 17,913 ft to 19,041 ft that of a 6 1/16 in. diamond bit, reached 20,603 ft, where the temperatures were 456° Fahrenheit. The rig was Penrod Drilling Co's Rig No 4. 4 illustr, 3 ref.

A *Cfbz Nh*

Geological investigations (1958-59) for the Channel Tunnel project

M. J. Tomlinson (George Wimpey & Co Ltd). *Times Science Rev* 1960 (37) pp 10-12 (Autumn)

Offshore boreholes had the dual purpose of confirming the indications of the geophysical survey and of providing samples for examination for physical characteristics. Drilling was done from a ship, the core barrel being a double tube with a detachable diamond or tungsten carbide tipped drilling bit. Difficulties encountered and methods used are described. 9 illustr.

D *Az Bnz.12:Cfb Nh*

Diamond in Birmingham

Anon. *Industr Diam Rev* 1960 Vol 20 (233) p 77 (Apr)

Reviews some of the interesting exhibits on show in Birmingham, 17 Feb - 16 Mar, 1960, including a diamond drilling machine of the type recently used in the preservation of Stonehenge, when one such machine was employed to drill holes in an upright needing strengthening. Another machine used a fine dental-type saw impregnated with diamond dust to remove part of an egg shell without damaging the inner membrane. Equipment of this kind is used at the Glaxo Laboratory. Diamond saws and a lathe with diamond-tipped tools are among other exhibits described. 1 illustr.

D *N.27*

From the factory [:] Diamond drilling bits—size of bit

Anon. *'Mindrill' Bits and Pieces* 1960 Vol 13 (3) p 6 (May)

A diamond bit is not necessarily the same size as the rock bit, unless the latter has drilled quickly and easily, leaving a straight, full gauge hole. When rock bit footage is 40 ft/h or less, the hole will usually be wavy and under gauge in places. Therefore, a diamond bit ¼ in. smaller than the rock bit should be used, depending on the hardness of the formation : otherwise, considerable reaming may be necessary with preliminary diamond drilling. Also, after diamond drilling, a rock bit ¼ in. larger can be run through the diamond cut hole. It is stressed that the most efficient combination of weight and rotary rev/min in different formations is influenced by several factors, some of which are described. 1 illustr.

D *Nkb.21*

Assistance for Rhodesia's smaller prospectors

R. B. Anderson. *Min J* 1960 Vol 255 (6521) pp 178-179 (Aug 12)

Reprint from *Chamber of Mines J*

Explains in detail the reasons for and the working of the new Exploration Section in the Southern Rhodesia Dept of Mines. Among equipment described is a self-contained diamond drill using non-coring tungsten carbide tipped bits or diamond coring bits.

See also *Industr Diam Abstr* 1960 Vol 17 p A149 (June).

D *Cfb Nh.12.363*

Diamond drilling is their business

R. P. Furniss. *'Mindrill' Bits & Pieces* 1960 Vol 13 (4) pp 2-3 (June)

Describes the formation of the Glindemann and Kitching proprietary company, covering some of its diamond drilling activities. 5 illustr.

D *Cfb Nh*

Improved diamond drilling

J. K. Hayes, V. Read. *Min Engng* 1960 Vol 11 (1) pp 49-55; *'Mindrill' Bits & Pieces* 1960 Vol 13 (4) p 4 (June)

See *Industr Diam Abstr* 1960 Vol 17 p A103 (Apr).

D *Cfb Nh*

How a difficult chalcopyrite-pyrite separation was made by flotation

W. R. Wade. *World Min* 1960 Vol 13 (7) pp 40-42 (June)

Diamond drilling of a heavy iron gossan proved very successful, revealing an underlying ore body of several million tons averaging 5.5% copper, with a maximum width of 300 ft between walls. 4 illustr.

D *Bec Cfb Nh*

News in brief

Anon. *Industr Diam Rev* 1960 Vol 20 (231) p 38 (Feb)

The Siberian scientific research centre in Novosibirsk is examining plans for drilling the earth's crust to depths of up to 12½ miles in order to get reliable information about the composition of the rocks which form the deep lying strata and obtain access to the places where deposits of minerals are formed, and also to use sub-terranean heat for power generation. One proposed site for the drilling is the area of Yakutia's kimberlite diamond pipes. *D* *Bnt Cfb.131.33*

Turbodrill of new construction

N. B. Babaev. *Neftyanoe khozyaistvo* 1960 (1) pp 36-38; *LLU Transl Bull* 1960 Vol 2 (8) pp 679-684 (Aug) (Original in Russian)

The fundamental defect of the existing construction of turbo-drills is considered to be that it continues working even when this is unnecessary. To correct the defect, a turbo-drill has been designed which permits remote switching off of the turbine during working. The drill described has passed successfully deep drilling tests. 1 illustr. *D* *Cfbd Pl*

News from factory and field

S. M. J. Smith. *Rangitaiki hydro-electric power development. Rotary core drilling—investigations; 'Mindrill' Bits and Pieces* 1960 Vol 13 (3) pp 4-5 (May)

Triple tube and split inner tube barrels were the most successful for the soft volcanic layers and the greywacke formations. Diamond drilling was used in hard volcanic layers while many methods were tried in alluvial formations. Various types of barrels used are described, including 'X' design, 'M' design, and split inner tube barrels. 2 illustr.

D *Cfbr Nh*

Nibble at the Mohole

Anon. *New Scientist* 1960 Vol 8 (195) p 419 (Aug 11)

The National Research Foundation of America has agreed to go ahead with the first stage of the Mohole project. Early in 1961, a specially fitted drilling barge will attempt to obtain cores from the ocean sediments in 12,000 ft of water off the Mexican coast. It is hoped to get samples from at least 500 ft into the seabed sediment, *ie* at least ten times as deep as has been possible hitherto.

See also *Industr Diam Abstr* 1960 Vol 17 p A129 (May); A190 (Aug).

D *Bnz Cfb.131.342*

Rotary drilling speeds Arkansas shaft sinking

M. Honke (Reynolds Mining Co). *World Min* 1960 Vol 13 (7) pp 22-25 (June)

Rotary drilling rather than conventional methods of shaft sinking has proved to be the safest, cheapest, and most certain method of reaching deep deposits of bauxite in central Arkansas. In a new underground mine, three circular shafts with a minimum inside diameter of 72 in. were drilled to depths over 500 ft—a new depth record for the district. 6 illustr.

D *Az Cfbr.342*

Regular phenomena in drilling stone. Experiments in rotary drilling, percussive drilling, rotary percussive drilling and rotary bit drilling. Gesetzmaessigkeiten beim Gesteinsbohren. Modellversucher zur Frage des Drehbohrens, Schlagbohrens, Drehschlagbohrens und Rollenmeisselbohrens

H. Wahl, G. Kantenwein, W. Schaefer. *Bergbau-Arch* 1959 Vol 20 (1/2) pp 58-90; abstr *Glueckauf* 1960 Vol 96 (1) p 76 (Jan 2) (In German)

Tests were made on sample pieces of rock under conditions as true to life as possible. Sintered carbide tools were used. *A* *Cfb.21*

How high rotary speeds shortens bit life, increases drilling costs

R. A. Cunningham (Hughes Tool Co). *Oil & Gas J* 1960 Vol 58 (28) pp 91-96 (July 11)

Gives results of laboratory investigations into how rotary speed affects rock bit bearing and tooth wear, drilling rate and minimum drilling cost. A combination of proper weight on the bit with moderate rotary speed and good bottom-hole cleaning is said to be the best way of reducing drilling costs and increasing bit life. 10 illustr, 9 ref. *L* *Cfbr Plb Uqe*

Mindrill F 25

Anon. *'Mindrill' Bits & Pieces* 1960 Vol 13 (4) pp 4-5 (June)

This diamond drill is designed to meet the exacting conditions of modern core drilling. The rolled section steel frame provides maximum rigidity and minimum weight, while the power unit may be selected from a variety of types. Other features are listed. Capacity is NX: 825 ft; BX: 900 ft; AX-AXT: 1,125 ft; and EX-EXT: 1,500 feet. *D* *Cfb Nh*

New bit replaces three others

Hughes Tool Co. *Petrol Engr* 1960 Vol 32 (8) p B-30 (July 15)

The Type RG-1J Tri-Cone is said to reduce drilling costs in extremely hard, abrasive formations by reducing round-trip time. Sintered tungsten carbide inserts on the gauge act as reamers and maintain hole gauge after the row at the gauge point and inner rows of inserts begin to wear. Thus the bit may be run long after other bits would have to be pulled, it is claimed, and there is no need for additional reaming operations when running a new bit. 1 illustr.

L *Plb*

Diamond bit features new design

Drilling & Service Inc. *Petrol Engr* 1960 Vol 32 (8) p B-30 (July 15)

The D & S Truco 'Frog-Eye' is designed for drilling hard formations below 13,000 ft to depths of 18,000 feet. On one occasion it drilled 1,924 ft below 15,000 ft at 5.6 ft/hour. The bit is of special value when lost circulation problems occur in conjunction with pressure compacted formations. Bits are custom designed to suit rig specifications and downhole conditions. 1 illustr. *L Nh.256*

USP 2,922,627 (June 7, 1956) **A. W. Kammerer, Rotary Oil Tool Co**

Rotary drill bits and cutters

The bit, intended mainly to be used for milling away a desired length of casing in a well bore, is designed so as to insure that the cutter body metal is more readily eroded by the casing than are the tungsten carbide cutting edges: metal riding along the severed top of the casing may otherwise prevent proper cutting action.

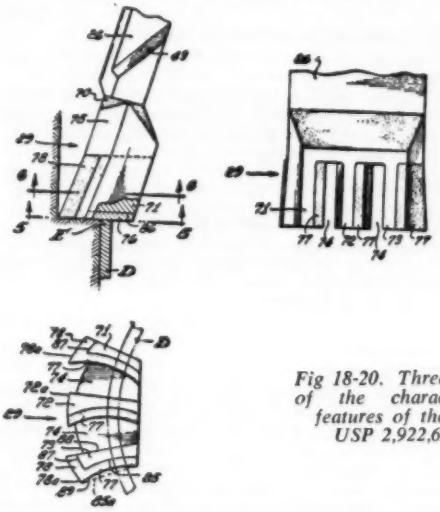


Fig 18-20. Three views of the characteristic features of the bit. USP 2,922,627.

Fig 18, 19 and 20 show the characteristic features, *ie* the forward faces 85, the bottom faces 86, and the reaming faces 87 with their hard facings 76, 77, 78 cutting the casing D. (15 claims, 10 illustr). Ref cited: 13 USP; 1 GP. *J Cfbr Plb.545*

WIRE DRAWING

Progress report on molybdenum disulfide as a ferrous wire drawing lubricant

P. M. Magie. *Wire & Wire Prod* 1960 Vol 35 (8) pp 997-999, 1054-1055 (Aug)

Among case reports on drawing stainless steel with molybdenum disulphide as an additive to the drawing lubricant, is one by a firm specializing in drawing stainless and iconel wire down to 0.001 inch. It is claimed that use of the additive increased both carbide and diamond die life by over 200 per cent. Reports are given on drawing high carbon and low carbon steel. *D An Bfd Cn Qr Skz*

GRINDING AND POLISHING OF CARBIDES AND METALS

The domain structure of magnetoplumbite

L. F. Bates, D. J. Craik, E. D. Isaac (Nottingham Univ). *Proc Roy Soc A* 1959 Vol 253 (1272) pp 1-5 (Nov 17)

Axial plane surfaces were obtained by placing a known basal plane of a selected specimen flat against the side of an accurately milled square section of brass and grinding perpendicularly to the basal plane, first with coarse emery papers and later with graduated diamond compounds, until a bright, scratch-free surface resulted. The final polishing direction was always perpendicular to the axial direction. 11 illustr, 10 ref. *D Bbhz Chm Kmg*

Summarized proceedings of a conference on some aspects of magnetism, Sheffield, September 1959

R. S. Tebble, D. E. G. Williams (Sheffield Univ). *Brit J appl Phys* 1960 Vol 11 (8) pp 307-313 (Aug)

A paper on domain patterns on single crystal yttrium iron garnet by C. E. Fuller. Dr. R. W. Teale and Dr. R. F. Pearson, mentioned the changes in surface pattern on a (211) face due to mechanical polishing with 1 μ diamond paste. The closely spaced parallel wall structure exhibited by the unpolished face gradually assumed a much wider spacing. The colloid deposits became fainter as polishing proceeded until the pattern could no longer be distinguished. 11 illustr. *D Bbh Chm Km Unk*

Graphite-impregnated wheels ?

A. Rakestraw. *Grinding & Finishing* 1960 Vol 6 (9) p 13 (Sep)

Reply to reader's letter.

The advantages of graphite as a filler impregnated in the pores of a grinding wheel are debatable, although it used to be thought to have much to recommend it in the grinding of tungsten carbide. It is considered here that the graphitic pellets serve no useful purpose in the operation since, as grinding proceeds, the graphite is released and passes into the coolant or into the exhaust system without having added materially to the actual metal removal. However, graphite, like many other materials used in the treatment of grinding wheels, might help prevent loads and sometimes reduce penetration of the grain, thereby improving finish. *D Pe Skf*

Main trends in the automation and mechanization of the machining processes in machine building

G. A. Terekhov. *Mashgiz, Moscow* 1959 pp 5-27; *LLU Transl Bull* 1960 Vol 2 (8) pp 635-669 (Aug) (Original in Russian)

In finishing operations, particularly grinding, where finish quality is important and where abrasive wheels may wear quickly, reducing inspection time is a problem. Automatic adjusting devices enable continuous operation of the machines and automatically change the cutting tool position, depending on the gauging results, and thus correct the dimensions of subsequent components. These devices are particularly useful in centreless and horizontal grinding where several identical components are ground simultaneously, making individual gauging during grinding often impossible in practice. Examples are given of the application of such automatic sizing. 8 illustr. *D Pr.25.133*

Maintenance of grinding wheels

J. De Feher. *Safety Maintenance* 1960 pp 14-16, 22 (Apr); *Pera Bull* 1960 Vol 13 (6) p 150 (June) *D Pe.138*

Russian research : Super finishing copper cylinders

A. J. Steiger. *Grinding & Finishing* 1960 Vol 6 (8) pp 28-29 (Aug)

A process for super finishing copper cylinders of 400 mm diameter and 1340 mm length, that employs water-cooled silicon carbide abrasive instead of oiled slate, has been developed in the USSR, according to a recent report in *Vestnik Maschinostroenie*. 3 illustr.

D *Ag Bfh Chs.131.33*

Wire ground with variable axial profile

Anon. *Metalworking Prod* 1960 Vol 104 (34) pp 55-56 (Aug 24)

Describes a Russian technique for grinding an axial profile on wires as thin as 0.0025 in. diameter. The method was developed for the manufacture of extractors used in dental surgery. A wire is passed through a guide bush and between a support plate and the periphery of the grinding wheel. If the wire is rotated, a circular cross section results : if not, a flat profile is produced. 3 illustr.

D *An Chc.1456.33*

Calculating stresses caused by grinding

I. I. Timofeev. *Izv vys ucheb zav ; mashinostr* 1959 (5) pp 174-183 ; *Library of Congress Mthly Index Russ Access* 1960 Vol 13 (4) p 1330 (July) (Original in Russian)

D *Chc Unq.131*

Device for grinding valve seats

O. H. Hulai, I. D. Bunenko. *Mekh sil' hosp* 1960 Vol 11 (1) pp 19-20 (Jan) ; *Library of Congress Mthly Index Russ Access* 1960 Vol 13 (4) p 1330 (July) (Original in Russian)

D *Az Chc*

Thermal studies on the vibration grinding of a hard alloy

E. G. Konovalov, V. N. Chachin. *Dokl AN BSSR* 1959 Vol 3 (11) pp 452-455 (Nov) ; *Library of Congress Mthly Index Russ Access* 1960 Vol 13 (4) p 1330 (July) (Original in Russian)

D *Bfxz Chc Qn Ud.21*

Miniature fast-turning grinding electric spindle

B. M. Malkin. *Mashinostroitel* 1960 (1) pp 20-22 (Jan) ; *Library of Congress Mthly Index Russ Access* 1960 Vol 13 (4) p 1330 (July) (Original in Russian)

D *Chc Pslz*

Using radioisotope transducers for an efficient inspection of grinding-machine parts

V. V. Kondashevskii *et al. Vestn mash* 1960 Vol 40 (1) pp 67-70 (Jan) ; *Library of Congress Mthly Index Russ Access* 1960 Vol 13 (4) p 1330 (July) (Original in Russian)

D *Az Chc Qd Syb*

How to avoid abrasive contamination of precision mechanical devices

L. McD. Schetky (Alloyd Corp). *Prod Engng* 1960 Vol 31 (33) pp 51-54 (Aug 15)

Recent optical investigations of ground, lapped, or honed metal surfaces, in precision electro-mechanical or hydraulic devices, have shown that these are never adequately clean. The article deals with the effects of this, how to detect it, and some unorthodox cleaning procedures to minimize its effects. 8 illustr.

E *Az Bf Ceq Qeb*

Avoiding temperature effects for high precision work

Anon. *Machinery, Lond* 1960 Vol 97 (2496) pp 591, 644 (Sep 14)

D *Az Ceqz Vb*

Check your contacts in surface grinding

J. E. Hyler. *Canad Mach & Metalworking* 1960 Vol 71 (8) pp 122, 164 (Aug)

The actual area of contact made by a surface grinding wheel with the work may be a function either of the wheel or of the work. Area is generally much smaller when the periphery of a wheel is used than when a cylindrical wheel or segmental chuck is employed on a vertical spindle machine. However, with either type of wheel, actual areas to be ground may make all the difference. The importance of this fact is illustrated. 3 illustr.

D *Chcm Pr.21*

Quality by coated finishing crankshafts

A. J. Kirsch. *Grinding & Finishing* 1960 Vol 6 (8) pp 30-31, 34 (Aug)

Describes coated abrasive lapping of bearing surfaces on crankshafts. It is stated that concentric surfaces conforming to their mates can readily be produced and excellent surface finishes can be obtained. 4 illustr.

D *Agn Chd Rdg*

Here's the right way to regrind carbide bits

R. Zimmerman. *Rock Prod* 1960 Vol 63 (4) pp 148, 150, 152 (Apr)

Photographs show correct shape and adjustment of bit in grinding machine for regrinding after wear. Recommendations of wheel width for different bit sizes are made. 15 illustr.

A *Al Bk Chc*

The cutting mechanism of fine-grain abrasive stone

T. Sasaki, K. Okamura. *Mem Fac Engng Kyote Univ* 1959 Vol 21 (4) pp 367-392 ; abstr *J Inst Met* 1960 Vol 88 (10) (June) ; *Metallurg Abstr* 1960 Vol 27 Pt 10 p 689 (June) (Original in English)

L *Rdz*

Sheet grinding process

National Electric Welding Machines Co ; Inland Steel Container Co. *Tool Engr* 1960 Vol 45 (2) p 135 (Aug)

A process developed for automatic grinding of edges on flat sheets is said to eliminate wheel dressing and grinder re-adjustment while effectively reducing the frequency of wheel replacement. Coated abrasive wheels are used, a self-regulating force inherent in the wheels allowing constant spindle speeds as the abrasive segment wears.

D *Az Chcs Pe Rdg*

Increased accuracy using high-pressure pneumatic measuring devices. Hoehere Genauigkeit bei Verwendung von Hochdruck-Luftmessgeraeten

Anon. *Technica* 1960 Vol 9 (14) pp 831-834 (July 1) (In German)

Among the applications discussed is the measuring of workpieces on centreless grinders. After the grinding process, if the workpieces are sufficiently long, they pass through the measuring point where they are tested for diameter and taper. The most up-to-date pneumatic electric and electronic measuirng instal!ations enable workpieces to be manufactured in pairs, even when high precision honing is being done. 14 illustr.

K *Az Chcc Vfd Wj*

Production of the 'Simca Aronde'. Production de la 'Simca Aronde'

Anon. *Mach Mod* 1960 Vol 54 (615) pp 9-16 (June)

The use of a Morris 1 automatic machine for regularizing the weight of the pistons and of the Ex-Cel!-O machine for finishing purposes are described. 16 illustr.

A *Agg Chm Prs*

Northern debut for gas exhibition

Anon. *Industr Diam Rev* 1960 Vol 20 (233) p 79 (Apr)

Reviews items of interest at the Gas at Work in Industry exhibition, 28 Mar - 1 Apr, 1960. The RJH 'Hippo' wet bandfacer polishing equipment, which uses special water-proofed abrasive bands with a water coolant, can be used for grinding ceramics, glass, and plastics.

D *Bl Chm Pee Sjz/Bm Chm Pee Sjz/Bp Chm Pee Sjz*

Refrigerator production in Japan

R. E. Green. *Machinery, Lond* 1960 Vol 97 (2493) pp 416-427 (Aug 24)

Grinding of cylinder head and other faces is done on a Japanese-built rotary, vertical spindle machine. Subsequent lapping eliminates the need for jointing gaskets. Many other grinding and precision machining operations are described. 16 illustr.

D *Ag Chc Pr.373*

Olympia in close-up—4

Anon. *Machinery, Lond* 1960 Vol 97 (2491) pp 325-332 (Aug 10)

Among design features illustrated is the automatic size control provided on the new type RSV range of vertical spindle grinding machines built by F. E. Rowland & Co Ltd of Reddish. The control is by means of a clarified coolant which is continuously discharged from a small orifice in the top of a tube. The coolant is directed against the underside of the grinding wheel and size control is derived from the back pressure generated as the wheel approaches the orifice. The accuracy of the system is said to be unaffected by the rough surfaces of coarse grade wheels. 26 illustr.

D *Agp Chc Pr Wpz*

Olympia in close-up—5

Anon. *Machinery, Lond* 1960 Vol 97 (2492) pp 381-388 (Aug 17)

Design features of equipment shown at the recent International Machine Tool Exhibition include set-ups of several grinding machines. 24 illustr.

D *Chc Pr.27.31*

New techniques keep jets flying

United Air Lines, South San Francisco. *Grinding & Finishing* 1960 Vol 6 (8) pp 24-25 (Aug)

A new type of vertical machine, the Heald 578, is capable of many grinding and associated operations on jet parts, *eg* grinding tips of rotor blades, turning and grinding stainless steel diffuser case joints, grinding bearing seats on shafts and in rotor shaft bores, and several toolroom grinding jobs. Jet parts need a big machine with considerable swing and travel, and rigidity for large components, yet lightness for smaller parts. Flexibility is also demanded in that several types of metal must be worked at a variety of speeds, feeds and controls. 1 illustr. *D* *Az Chc Pr*

Semi-automatic grinding and polishing

Anon. *Progressus* 1960 Vol 41 (E3) p 63 (June)

The machines described are single shaft automatic grinding and polishing machines used in pairs in conjunction with double-ended polishing spindles; an automatic four-spindle machine with two polishing units for use with grinding paste such as PZ 80 paste; round table machines with three polishing units and hydraulic units; and finally round table with five grinding and polishing units, with compressed air oscillators and compressed air lifting and pressure attachments. 4 illustr.

A *Chc Prsb/Chm Prsb*

Automated plant for versatile manufacture

A. Schatz. *Progressus* 1960 Vol 14 (E3) pp 41-62 (June)

Reviews a wide variety of machines for all types of sawing, cutting, milling and boring, turning and grinding. Amongst the sizing and surface finishing machines mentioned is one by Robert Blohm, Hamburg-Bergedorf, which has a diamond copy wheel forming attachment. This is mounted on the spindle head and enables the contours of a large template to be translated at a rate of 1 : 5 to produce wheel forms up to 2 in. wide and 1 in. deep. The movements of the diamond tool are only one-fifth of the template dimensions, so that close tolerances can be held. Machines for repairing and sharpening tools are also shown. 79 illustr.

A *Chc Pr :Cz Nv Psc*

Carbide inserts foster unique grinding operations

M. M. Patterson. *Grinding & Finishing* 1960 Vol 6 (8) pp 26-27 (Aug)

Vascaloy-Ramet sintered carbide inserts must be ground and finished on all surfaces; techniques adopted by the company are described here. One example is grinding the faces of the rough blanks on a Besly-Welles DV2 vertical spindle double disk grinder, using metal bonded diamond wheels at a speed of 13,000 spindle ft/minute. Thickness is held to ±0.005 in., faces are flat and parallel to within 0.001 in., a finish of 8 r.m.s. or less is held. Production is now 2,700 passes/h, removing 0.003 in./pass, each insert making three passes. Diamond wheels are also used for grinding the periphery of all shapes of insert on a Harvill-Johnson throwaway grinder. 4 illustr.

See also *Industr Diam Abstr* 1960 Vol 17 p A263 (Oct). *D* *Alz Bkc Chc Nv*

A new Hahn & Kolb lapping machine. Eine neue Hahn & Kolb-Laeppmaschine

R. Clar. *Von Werkzeugen u Werkzeugmaschinen* 1960 (18) pp 13-15 (Aug) (In German)

The double-disk lapping and fine grinding machine model ZL 500 is a further development of model LHD O. There are four different revolution speeds which enable the machine to undertake any lapping and fine grinding work, it is claimed. An electrically controlled truing device trues the cast lapping disks by means of carbide truing tools, or the fine grinding disks by means of diamond. By using the two tools, both disks can be trued simultaneously. Specifications are given. 5 illustr, 1 chart. *A* *Chd Pr Psf*

Cleaned coolant cuts costs . . . ensures superfine finish

Anon. *RCI Standard* 1960 (5) p 16 (June)

The problem of sludge and swarf removal is inseparable from wet grinding and honing operations. The coolant becomes loded with foreign matter and work quality is affected unless the coolant is purified before re-circulation. Attempts to keep coolants uncontaminated by conventional methods of filtration have never succeeded, largely because rate of contamination is so rapid that the filtering medium becomes clogged and restricts coolant flow. Philips Coolant Clarifiers are claimed to overcome the problem. Three types are made, in two of which the ferrous particles are trapped magnetically. All are fully automatic, except that the sludge container needs emptying, and are small enough to be placed beside most grinding or boring machines. The Magna-Drum, Universal Clarifier, and Magna-Fabrix clarifiers are all described. It is stated that in addition to improving quality of work, up to 100% longer tool life is ensured and dressing costs in time and money are saved. 1 illustr. *D* *Ceq Sj Unf*

Internal grinder

Robert Speck Ltd, Rickmansworth, Herts. *Ind Equipt News* 1960 Vol 9 (4) p 52 (Mid-Feb)

The Morini & Bossi Coppier MC 49 internal grinding machine is designed to grind holes from 0.04 in. to 0.8 in. diameter in dies, gauges, et cetera. Tungsten carbide and other alloy steels can be ground to an accuracy of 0.000012 in. for roundness and concentricity and 0.00001 in. for surface finish. Two MC 52 turbo spindles, an infinitely variable spindle speed between 60,000 and 130,000 rev/min, and compensation for grinding wheel wear at each truing are features of the machine. 1 illustr. *A Chcn Pr*

Balfour-Hunt drill flute grinder

Herbert Hunt & Sons Ltd, Elsinore Rd, Old Trafford, Manchester 16. *Metalworking Prod* 1960 Vol 104 (25) p 246 (June 22)

For grinding flutes of drills form the solid hardened material, this machine is hydraulically operated and built to prevent vibration affecting the quality of the ground finish. All motions are controlled from one central location by push-button. Once set, the grinding cycle is fully automatic. Capacity is for drills from 0.25 to 6 mm diameter with a flute length of 3¼ inch. Feed is hydraulically operated and set by a lever control giving a variable rate between 8 and 32 in./minute. The machine can be adapted for multiple fluting when needed. 1 illustr.
D Albz Chc Pr

Do you want uniformity and production ?

C. E. Wesson. *Grinding & Finishing* 1960 Vol 6 (9) pp 86-88 (Sep)

A new rise and fall abrasive belt machine, the double-spindle Loungway Grinder, is said to solve the problem of form and contour grinding of small parts which were formerly ground or finished by hand. The results described here show increased uniformity and production. 7 illustr. *D Chcb Pee Pr*

[Metallographic polisher]

Nash & Thompson Ltd, Oakcroft Rd, Chessington, Surrey. *Gemmologist* 1960 Vol 29 (347) p 108 (June)

An apparatus for polishing metallographic specimens can easily be adapted for mineral specimens. After preliminary grinding, the specimens are placed in the tray of a vibrator. The tray, about a foot in diameter, is prepared for polishing by mounting a specially woven nylon cloth impregnated with 6 μ size diamond dust paste over a rigidly fixed ¼ in. glass plate. It is said that no skill is needed to operate the apparatus. Large specimens, up to about 5 in. across, and small ones, can be polished together, the latter being weighted by lead collars.

See also *Industr Diam Abstr* 1960 Vol 17 p A297 (Nov).
D Bca Chm Kmg Pr/Bfa Chm Kmg Pr

Tool steel troubleshooting

E. A. Steigerwald. *Tooling & Prod* 1960 Vol 26 (6) pp 53-56 (Sep)

Deals with common tool steel problems. One factor sometimes responsible for poor tool wear is incorrect grinding of the heat treated tool, when the heat generated by grinding can be so high as to overtemper locally or even re-austenitize the steel. Grinding burn or grinding softness is another problem, but can often be avoided if wheels are dressed soon enough. Metallographic examination is the best way of detecting grinding burn, while in some cases tool discolouration may be an indication of grinding troubles. 5 illustr, 2 tables. *D Al Bfd Chc.1313*

Internal external grinder

Rudkin & Riley Ltd, Aylestone, Leics. *Mach Lloyd* 1960 Vol 32 (13A) p 38 (June 25)

A cylindrical grinder is said to have ample power and speeds to handle a wide range of internal and external grinding jobs ; in addition, attachments can be obtained which greatly widen the scope of the machine. 1 illustr.
D Chcl Pr/Chcn Pr/Chcz Pr

A new hand polishing machine

Rudkin & Riley Ltd, Aylestore, Leicester. *Industr Diam Rev* 1960 Vol 20 (230) p 18 (Jan)

Model 2006/3 is described. The machine is normally supplied for bench mounting but a cast column stand can be provided as an extra. Since chucks of up to 7½ in. diameter can be fitted, a wide range of articles can be taken by the machine. 1 illustr.
D Chm Pr

Jones & Shipman No. 1015 Super-S-Hydrosine cylindrical grinding machine

A. A. Jones & Shipman Ltd, Narborough Rd South, Leicester. *Machinery, Lond* 1960 Vol 97 (2493) pp 443-447 (Aug 24)

The machine has been introduced to facilitate the repetitive production of parts to tolerances on diameter of the order of ±10 micro-in., expressed as a departure from the diameter of a previously produced master part, with surface finishes 2 micro-in. or less. Initial testing of the machine is described and operation explained. 5 illustr. *D Chcl Pr*

Machine holds non-round work for polishing and buffing jobs

Hammond Machinery Builders Inc, 1600 Douglas Ave, Kalamazoo, Mich. *Amer Mach* 1960 Vol 104 (15) p 146 (July 25)

The Hammond Cammed Junior Automatic, Model EPC, is especially designed to hold other than round workpieces that are being polished or buffed by regular lathe or abrasive belt machines. It can be easily adjusted to hold round parts as large as 14 in. in diameter. 1 illustr.
D Az Chj Pr/Az Chm Pr

Grinder has spindle adjustment for various lead angles

US Electrical Tool Co, 3640 Llewellyn St, Cincinnati 23, Ohio. *Mach Tool Blue Bk* 1960 Vol 55 (8) pp 205-206 (Aug)

A special purpose thread grinder features spindle adjustment for various lead angles and the motor is adjustable on its base with the angle of the spindle. The unit is designed for engine lathe cross slide mounting for thread grinding, and is available in various horse powers. Vertical feed adjustment allows centre line alignment. A built-in wheel dresser can be supplied, as can pulleys for several sizes of wheel, either vitrified or resinoid. 1 illustr.
D Chcp Pr

One centreless—four operations

Anon. *Metalworking Prod* 1960 Vol 104 (34) p 57 (Aug 24)

Four operations on a hydraulic piston are done in one pass on a Wickman-Scrivener No 3 centreless grinder, which features four grinding wheels and a walking-beam transfer device to present the component to each wheel in turn. The operations are described. Tolerance on od is 0.0004 inch. The machine has Sigma automatic sizing and provision is made for dressing all wheels after a pre-set number of pieces have been completed. 2 illustr.

See also *Industr Diam Abstr* 1960 Vol 17 p A255 (Oct). *D Chcc Pr*

Barrel finishing

Pangborn Corp of America ; Hepburn Conveyor Co Ltd, Rosa Works, Wakefield. *Metal Ind, Lond* 1960 Vol 97 (1) p 11 (July 1)

Vibratory finishing is said to offer certain advantages over conventional barrel finishing. The Pangborn machine has provision for varying amplitude and varying frequency, enabling a wide range of work to be done at greatly increased production rates. Speeds are claimed to be from 10 to 100 times faster than those achieved with tumbling barrels, while less media and compounds are needed for any given amount of work. The process is visible during operation. The machine is suitable for severe cut down or for delicate work, *eg* laminations 0.006 in. thick and 4 in. diameter have been deburred and finished without distortion. By this system, interiors and shielded surfaces can be pressed and cleaning, deburring, fine finishing, *etc* are possible. 1 illustr. *D Chmz.21*

Adjustable cutter blades give rapid re-set

Wickman Ltd, Coventry. *Metalworking Prod* 1960 Vol 104 (35) p 74 (Aug 31)

Re-servicing of large face milling cutters is simplified by utilizing the off-hand grinding method in conjunction with a special grinding jig and setting block on the recently introduced Wickman Rapid Re-set system. Each blade is ground separately, without removing the body from the machine unless required. 2 illustr.
D Alz Chc.1456

Thread grinding machine. Die Schneckenschleifmaschine HSS 33B

Anon. *Die Maschine* 1960 Vol 14 (1) p 38 (Jan) (In German)

Model HSS 33B has a double-cone grinding wheel of from 300 to 485 mm diameter, enabling both sides of a thread to be ground simultaneously in a back-and-forth movement, or one side on the forward and the other on the reciprocating movement. Two truing diamonds are provided for the sides of the wheel and one for the external diameter. A special truing device and template grinding attachment are supplied. A wide range of workpieces can be machined with this grinder. 4 illustr.
A Abmb Cgh Nj Psf:Chc Pr

Taft-Pierce Mfg Co

Taft-Pierce Mfg Co ; British Rep : Rockwell Machine Tool Co Ltd. *Machinery, Lond* 1960 Vol 97 (2496) pp 606-607 (Sep 14)

The Taft-Pierce Supfina No 86 centreless, plunge cut microstoning machine for the high-production finishing of small parts, operates on an automatic cycle, the rapidly oscillating abrasive stone being applied to the work while the latter is supported and turned by two rotating rolls. The process is said to remove chatter marks and feed spirals and to correct roundness errors as well as to produce a high surface finish. Surface finishes down to 1 micro-in. are possible, depending on conditions. The company's No 1 precision surface grinders, one of which has a Diaform wheel dresser, and a 24 in. semi-automatic lapping machine, are also mentioned. 1 illustr.

See also *Industr Diam Abstr* 1960 Vol 17 p A16 (Jan).
D Chc Pr.27.342/Chcm Pr:Nj Psf

Adjustable center reduces setup time

Enco Manufacturing Co. *Grinding & Finishing* 1960 Vol 6 (8) pp 37-38 (Aug)

Simple, quick set-up and adjustments can be obtained by use of a new adjustable centre, the Micro-Set. Tapers or corrections can be ground up to 0.012 in. on the diameter to tenths with almost no set-up time, it is said. 5 illustr. *D Psz*

Matrix Thompson Truforming grinders

Anon. *Metalworking Prod* 1960 Vol 104 (33) pp 77, 79 (Aug 17)

Truforming is described as an accurate, fast method of producing identical parts by transferring the shape or form of a pre-formed crushing roll first to the grinding wheel and then to the work. The crushing process is said to effect stock removal. One of the smallest Truforming grinders, BT8-12-36, with a 14 in. diameter by 2 in. wide grinding wheel, is described. 1 illustr.
D Ab Cgj Psf:Chc Pr

New tool grinding machine. Eine neue Staehleschleifmaschine. Nouvelle affûteuse d'outils

E. Mettler. *Eurotec* 1960 (10) pp 1, 41-46 (July) (In French and German)

The Scherer machine, for grinding turning tools with a cross section up to 80 × 100 mm, makes it possible to re-use carbide inserts which have broken away from the tool, or broken tool shanks. In machining shank materials and sintered carbide the stock removal is at a rate of 2.2 cu. cm/min ; in the case of HSS, removal is 5 cu. cm/minute. Instructions are given for the use of the machine : if they are carried out in rough grinding, considerable diamond finishing time is saved. 5 illustr. *A Al Bkc Chc Pr*

Two centreless grinders instead of five

Drummond-Asquith Ltd. *Metalworking Prod* 1960 Vol 104 (33) p 71 (Aug 17)

An automatic linked line for grinding gudgeon pins usually has five centreless grinders and two lappers, yet a grinding finish that needs only one lapping pass can be obtained by using two centreless grinders, one for roughing and one for finishing, as is illustrated by the Lidkoping link line for gudgeon pins. Operation is described. 3 illustr. *D Chcc Pr*

Machine handles buffing, grinding, deburring jobs

Murray-Way Corp, Birmingham, Mich. *Mach Tool Blue Bk* 1960 Vol 55 (8) p 247 (Aug)

The Han-D-Matic machine for burring, grinding, and deburring, consists of a standard low cost basic pedestal and spindle unit with a wide selection of optional, interchangeable components which will accommodate workpieces of practically any shape. Good quality work is said to be produced faster and with less operator fatigue. 1 illustr.
D Chm Psc:Chc Pr

Two-sided adhesive film holds work for grinding

Gleason Works, 1000 University Ave, Rochester, NY. *Mach Tool Blue Bk* 1960 Vol 55 (8) p 238 (Aug)

Double-Face adhesive film is designed to hold non-ferrous metals on magnetic chucks for surface grinding operations. It is a translucent pressure-sensitive mass in film form, supported by a protective release paper. By applying the film directly to the work, the operator can place each piece exactly where he wants it. Adhesive qualities of the film are not affected by coolants. 1 illustr. *D Bff Chcm Qr*

Landis Tool Co

Landis Tool Co, East 6th St, Waynesboro, Pa. *Grinding & Finishing* 1960 Vol 6 (9) p 58 (Sep)

Four surface grinders are described, including the Landis Hydrabrasive 1224 precision surface grinder with automatic incrematic downfeed for grinding a wide variety of parts. This machine, equipped with unique tooling, does a difficult groove grinding job on special twister guides for the production of steel rod. 1 illustr. *D Chcm Pr*

Brown & Sharpe Mfg Co

Brown & Sharpe Mfg Co, Providence 1, RI. *Grinding & Finishing* 1960 Vol 6 (9) pp 2o, 30 (Sep)

A new grinding machine headstock, using bearing design, is said to demonstrate the highest accuracy yet obtainable for roundness and end camming. It is claimed possible to grind round within ten millionths using this headstock. 1 illustr.

D *Chc Pr Psg*

The Heald Machine Co

Heald Machine Co, Worcester 6, Mass. *Grinding & Finishing* 1960 Vol 6 (9) p 64 (Sep)

The Model 4 Tool Sharpener permits either elliptical or true radius tip grinding of carbide or HSS cutting tools. The conical shape, with constant clearance angle and tool tip radius, produced in true radius tip grinding is said to be ideal for contouring work. Greater boring accuracy results since tool contact varies with workpiece configuration. The sharpener combines adjustability of the axis of tool holder oscillation with an additional fine radius vertical setting to grinding true-radius. Tool reciprocation is completely automatic and set-up and operation extremely simple, it is claimed. 1 illustr.

D *Al Bfdg Chcz Pr/Al Bfdg Chcz Pr*

The Heald Machine Co

Heald Machine Co, Worcester 6, Mass. *Grinding & Finishing* 1960 Vol 6 (9) pp 38-39 (Sep)

Two internal grinders, Model 090 and Model 171A, are said to be capable of handling internal work with increased upper and lower limits, as well as having better feed methods, coolant control, and greater compactness. 1 illustr. *D* *Chcn Pr*

Transfer line hones V-blocks

Barnes Drill Co, Rockford, Ill. *Canad Mach* 1960 Vol 71 (6) p 190 (June)

An automatic honing transfer line uses vertical type honing machines with fixtures designed to tilt the V-shaped motor block so that the bore is in a vertical position for honing. One six-spindle machine hones two V-6 blocks and a three-spindle machine hones a V-12 block : the operations are not simultaneous. Both units have air counter-balance and a safety interlock holds the head in position while the work indexes or when the stones are changed. Size consistency is held within 0.0003 in., and stock removal is 0.002 to 0.0035 inch. Operation of the two units is briefly described. 1 illustr. *D* *Az Chh Pr*

Van Norman Machine Co

Van Norman Machine Co, Springfield, Mass ; British Rep : Catmur Machine Tool Corp Ltd. *Machinery, Lond* 1960 Vol 97 (2496) pp 612-613 (Sep 14)

The Lectro-Cam type 1-M is designed for grinding inner races of miniature bearings to tolerances of less than 0.00005 in. and a finish of the order of 3 micro-inches. Other exhibits by the company at the Chicago Exposition are mentioned. 1 illustr.

D *Ay Chc Pr.27.342*

Honing of receptacle borings for ball bearings. Das Honen von Aufnahmebohrungen fuer Waelzlager

Nagel GmbH. *Maschinenwelt u Elektrotechnik* 1960 Vol 15 (9) p 372 (Sep) (In German)

In this Nagel honing device, the tool is firmly attached to the hone spindle and the diamond hone is claimed to give precision results and long tool life. The special honing machine is also useful for small, short borings. 1 illustr. *A* *Chh Nqc Pr*

Norton Company

Norton Co, Worcester 6, Mass. *Grinding & Finishing* 1960 Vol 6 (9) p 30 (Sep)

A new automatic wheel balancer was demonstrated at Chicago on a 10 × 18 in. Type CTU cylindrical grinder. This device is said to enable wheel balancing by unskilled operators in 5 sec, to be made completely safe by interlocks and to require no basic change in the wheelhead design, while spindle bearings are undisturbed. An automatic wheel contact accelerator is designed to eliminate 'grinding air' during an automatic grinding cycle if the particular workpiece is under the maximum expected size of work coming to the machine. Greatest savings are possible when workpieces have considerable variation in diameter.

D *Chc Pr:Pe Qq Psc*

Norton Company

Norton Co, Worcester 6, Mass. *Grinding & Finishing* 1960 Vol 6 (9) pp 42-43 (Sep)

The No 12F Hydrolap high production lapping machine is widely used in the manufacture of miniature precision bearings. It was exhibited at Chicago with a view to suggesting possible applications in high production lapping of small parts in a two face abrasive lapping machine. A new loader is described. Parts can be lapped to very close tolerances for size and parallelism as well as low micro-in. finishes, it is claimed. *D* *Ay Chd Pr*

Norton Company

Norton Co, Worcester 6, Mass. *Grinding & Finishing* 1960 Vol 6 (9) p 25 (Sep)

Higher wheel speeds of 8,500 spindle ft/min for cylindrical grinders were introduced by the company at the Chicago Exposition. This increase from the previous maximum of 6,500 spindle ft/min is reported to result in grinding time reductions of up to 30% on many jobs, as well as better finish and less frequent wheel truing. It is stressed that wheels and machines for high speed operation are tested in accordance with the American Standard Safety Code for abrasive operations and are specially marked. Non-approved wheels must never be used on high speed machines.

D *Chc Pr.27.342*

DeVlieg Machine Company

DeVlieg Machine Co, Jigmil Div, Fair St, Royal Oak, Mich. *Grinding & Finishing* 1960 Vol 6 (9) p 62 (Sep)

The DeVlieg Micropoint tool grinder is said to be the first capable of absolute control of tool geometry. This precision machine, it is claimed, makes possible a new technique of single point tool grinding. Advantages of the new technique include greater cutting tool life, increased accuracy and output of machine tools, and greatly improved uniformity and finish of the end product. It is recommended as being particularly important in grinding pre-set tools for numerically controlled machines. 1 illustr.

D *Al Chc Pr*

Microminiature wheels

Bay State Abrasive Products Co, 15 Union St, Westboro, Mass. *Tool Engr* 1960 Vol 45 (2) p 117 (Aug)

It is claimed that microminiature grinding jobs can be speeded up economically by use of grinding wheels with dimensions of 0.085 in. diameter, 0.036 in. thickness and 0.034 in. bore size. The wheels replace the mounted point type, reducing cast by 75% since only the wheel needs replacement. Wheel replacement does not affect tool alignment, it is stated. Wheel speeds are up to 40,000 rev/minute. 1 illustr.

D *Chc Pez*

Micromatic Hone Corporation

Micromatic Hone Corp, Detroit, Mich; British Rep: A. A. Jones & Shipman Ltd. *Machinery, Lond* 1960 Vol 97 (2496) pp 623-624 (Sep 14)

A type 2VB machine for honing truncated spherical surfaces is said to produce a true spherical form within 0.0003 in. and surface finishes of 6 to 10 micro-in. r.m.s.; a self-dressing abrasive cup removes 0.002 in. of stock from the surface in 24 seconds. When 'Carbond' abrasive is used, stone life is about 400 pieces. The machine can be arranged for fully automatic operation. Other honing machines produced by the company are described. 1 illustr. *D Chh Pr.27.342*

BP 826,938 (June 1, 1955) **A. Blainey, UK Atomic Energy Authority**

Production of grinding surfaces

A layer of a suspension of particles of zirconium or titanium in the size range between 20 and 200 μ, in an evaporable organic liquid such as xylene, is applied to a clean metal or alloy body. The body and the layer are then heated to at least 900° C *in vacuo* to bond layer and metal body. The cleaning is preferably done by pickling and/or abrasion, and the surface may be given a preliminary coating of zirconium rich alloy or zirconium (cf. BP 820,614). The body may be stainless steel or nickel alloy, or Monel metal. Substances to be ground with such surfaces include uranium carbide or uranium oxide, the grinding being effected under molten metal or alloy of low melting point, *eg* sodium-potassium alloy, lithium, lead, bismuth, tin. (5 caims). *J Az Chc.545*

USP 2,922,263 (Sep 4, 1956) **C. J. Bogert sen**

Convex form tool grinding and cam generator and method

A cam blank is placed in a certain position with respect to a zero point corresponding to the centre of the convex curve to be ground on the tool bit, and locating holes are drilled. Then a cam generator incorporating a pivotable table with locating pins for hold.ng the cam blank is placed on the table of a grinding machine, and the correct cam line ground by pivoting the table holding the blank. This cam is used for controlling the movement of the cutting bit, so that the operator only has to select the proper cam for a particular tool bit and then grind or regrind a number

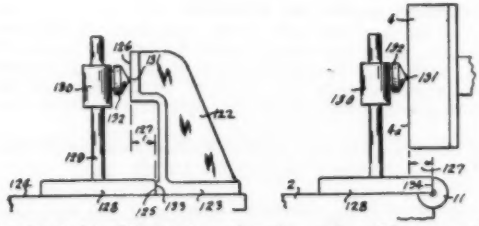


Fig 21 (left). Illustration of truing point 131 set up for the grinding wheel, showing setting gauge 122.
Fig 22. Another view of the set-up. USP 2,922,263.

of bits accurately to the shape required in much less time than was hitherto possible. The setting up of the diamond truing point 131 for the grinding wheel is illustrated in Fig 21 and 22. In Fig 21, 122 is the setting gauge, 127 being a distance chosen to suit a certain cam. (6 claims, 19 illustr). Ref cited: 4 USP; 1 BP. *J Al Chc Pr.545*

USP 2,922,264 (Feb 1, 1955) **W. G. Mushrush, Syntron Co**

Method of lapping

(7 claims, 7 illustr). Ref cited: 11 USP.

See BP 823,154; *Industr Diam Abstr* 1960 Vol 17 p A80 (Mar). *J Chd.545*

FP 1,202,803 (Jan 14, 1954) **J. Rivera**

Grinding machine. Machine à rectifier

The machine is designed to grind cylindrical and conical gear wheels with automatic reciprocation of the wheel, movement of the blank, and change of orientation of the wheel to grind both flanks of the teeth. Transmission is effected by steel bands running

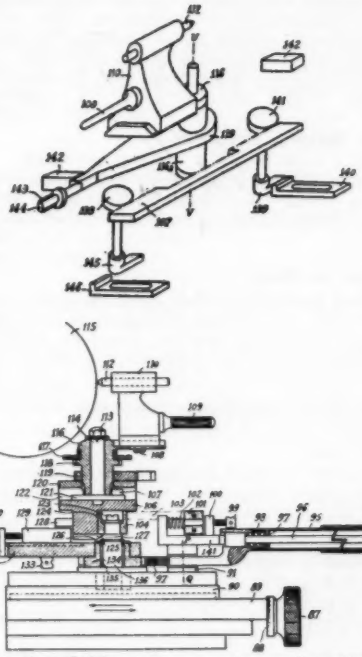


Fig 23 (top) and 24. A cross section and a view of the device in perspective. FP 1,202,803.

over drums, the movements being hydraulically controlled. The truing device operates with a diamond point whose movement is derived from a straight bar rolling on a base circle so that the point describes an involute. For this purpose, the straight bar is connected to the base circle by a band to which it is applied by pulleys which relieve the band from any strain. The amplitude of the control lever producing the rolling movement of the bar can be reduced by a segment and pinion mechanism. Fig 24 is a cross section of the device shown in perspective in Fig 23. 106 is the straight bar rolling on base circle 104, the bands are marked 103, and the pulleys 128 are arranged on slide 129. The device is operated by lever 95 turning about axis P-Q. (11 claims, 11 illustr).

J Chc Pr.545

DAS 1,070,957 (Nov 18, 1955) **C. Krug, Diskus Werke Frankfurt/Main AG**

Grinding wheels, in particular face grinding wheels. Schleifkoerper, insbesondere Stirnschleifkoerper

(1 claim, 1 illustr). Ref cited: 1 DPB, 1 Swiss P, 1 BP, 4 USP. *D Pe.545*

MACHINING DEVELOPMENTS

Submicroscopic grinding

Stanford Research Institute, California. *New Scientist* 1960 Vol 8 (193) pp 286-287 (July 28)

Long-range research is being done on the use of low-energy electron beams for forming metals and insulated parts for the solid circuits of computors in 'submicroscopic dimensions'. The shaping is done by bringing about certain chemical and physical reactions. The aim is to manufacture up to 100 billion components within a cubic inch. *L* *Bnz Cfb.131.342*

Today's trends in the removal of metal

M. M. Barash (Manchester Univ). *Engineering, Lond* 1960 Vol 190 (4915) pp 27-28 (July 1)

The more recent methods of machining are reviewed: arc machining, electrolytic machining, electron beam milling, ultrasonic machining, and chemical milling. 6 illustr. *A* *Bf Ceq.1456*

Electrical discharge machining

Anon. *Tool Engr* 1960 Vol 45 (2) p 147 (Aug)

Electrical discharge machining can reduce costs and improve products and design. Two types of equipment are distinguished, and typical applications are listed. *D* *Ceqm.21*

Electrolytic machining

Anon. *Tool Engr* 1960 Vol 45 (2) p 143 (Aug)

Electrolytic machining is distinguished from electrical discharge machining and the areas in which it has advantages over other techniques are listed. *D* *Ceqh.21*

Spark machining joins band cutting team

Anon. *Steel* 1960 p 90 (Mar 28); *Pera Bull* 1960 Vol 13 (6) p 150 (June)

A bandsaw unit uses the spark machining concept to slice fragile honeycomb structures with burr-free surface and reduced distortion. *D* *Az Ceqm*

Electropolishing copper alloys—a revival

H. E. Zentler-Gordon, S. C. Boyle. *Metal Ind, Lond* 1960 Vol 97 (12) pp 227-230 (Sep 16)

7 illustr, 2 ref. *D* *Bfh Chmk*

USP 2,920,180 **W. Ullmann, W. Ehrlich, Agie AG fuer industrielle Elektronik**

(Mar 18, 1957—conv date, Switzerland)

Electroerosive grinding method and device for its performance

In order to eliminate cratering of surfaces by excess current concentration on projecting points, *eg* chips, the electrode is divided into sections which are insulated from one another while the maximum current flowing through these sections is individually limited. The electrode is vibrated relative to the workpiece and the sections may be inclined relative to the direction of movement of the electrode surface, so that those areas which would have been opposite the insulated portions of the electrode are also ground. (12 claims, 22 illustr). Ref cited: 14 USP. *J* *Ceqn Pt.545/Ceqn.1456.545*

FP 1,202,296 **Agie AG fuer Industrielle Elektronik**

(Mar 18; July 3, 1957—conv dates Switzerland)

Electroerosive grinding method and device for its performance. Procédé de meulage par électroérosion et dispositif pour l'exécution de ce procédé

See USP 2,920,180; *Industr Diam Abstr* 1960 Vol 17 p A292 (Nov). (33 claims, 22 illustr). *J* *Ceqn Pt.545/Ceqn.1456.545*

USP 2,920,026 (May 1, 1952) **S. S. Kistler, Norton Co**

Grinding machine

The machine is an electrolytic grinder intended for grinding hard carbides. The grinding wheel is kept free cutting by slow electrolytic removal of the wheel bond. A diamond wheel is used with a sintered metal bond preferably of 82% copper and 18% tin with the diamond portion not exceeding 25% by volume. The face 72 of wheel 65 in Fig 25 will gradually load up

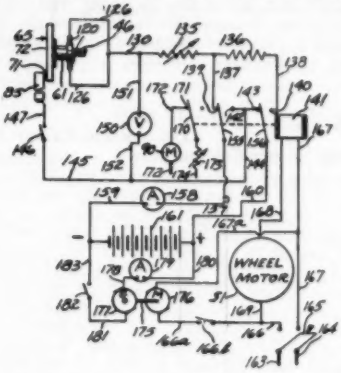


Fig 25. Diagram of the essential parts of the grinder in which wheel face 72 is kept free cutting by slow electrolytic removal of the wheel bond. USP 2,920,026.

and glaze: this will result in overloading wheel motor 51 and if excessive infeed then continues, the current through relay 141 will rise to a critical point swinging switch arms 155 and 156 to the right. Grinding wheel 65 will then become positive and workpiece 71 in holder 85 negative so that electrolytic action removes metal bond from abrasive face 72. During this wheel truing period, infeed of wheel 65 must be stopped. This is achieved by automatically stopping infeed motor 90 by switch arm 170 moving simultaneously with arms 155 and 156. After a short time, the current passing through motor 51 will drop and the switch arms will return to grinding position. (8 claims, 12 illustr). Ref cited: 8 USP; 1 BP; 1 FP; *Steel* 1952. *J* *Chc Pr:Nv Psf.545*

USP 2,922,021 (July 2, 1956) **M. H. Morris, Sperry-Sun Well Surveying Co**

Machining method and apparatus

For drilling extremely hard materials, *eg* tungsten carbide, spark machining requiring expensive apparatus has been used. However, a conventional drill press may be employed with the same or better effect in the arrangement shown in Fig 26. Spindle 4 in chuck 2 of

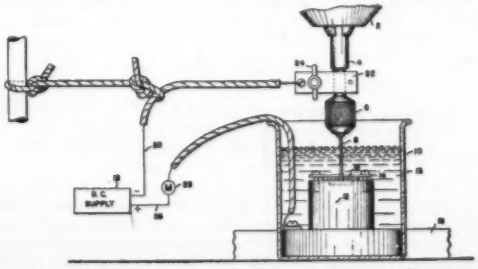


Fig 26. Illustration of an arrangement allowing a conventional drill press to be used in the machining of very hard materials. USP 2,922,021.

the ordinary drill press carries a small chuck 6 with a tungsten drill rod 8 without a shaped point. A glass insulating vessel 10 contains support 12 for workpiece W immersed in carbon tetrachloride. Direct current of 20 V at 2 A (not critical values) is supplied, the negative terminal being connected to the drill rod. The drill is rotated while pressed downwards by hand so that the ammeter reads 2 A during operation. Relatively little heat is developed and no boiling occurs. The holes obtained are only slightly larger than the diameter of the rod. Any alloys which are otherwise only machinable by diamonds may be drilled by this method. (9 claims, 1 illustr). Ref cited : 5 USP.
J *Ba Cfb.545*

DAS 1,073,654 (Sep 6, 1958) **K. H. Steigerwald, Carl Zeiss**

Device for an apparatus for machining materials by means of a beam of charged particles. Einrichtung in Geraeten zur Materialbearbeitung mittels Ladungstraegerstrahl

As shown in Fig 27 the device 12 protects the electro-magnetic lens 10 against damage by a beam of particles 8 impinging on workpiece 11 and limited by

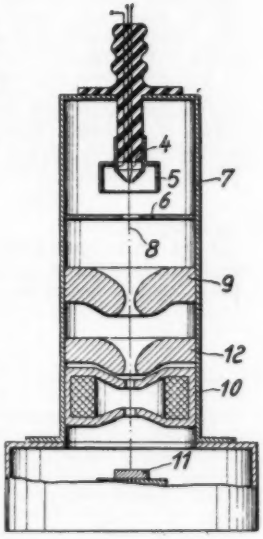


Fig 27. Lens 10 is protected by device 12 against damage by impingement of charged particles 8. DAS 1,073,654.

a movable aperture disk 9. The protecting device 12 is a thick-walled disk having a funnel-shaped aperture with rounded rims made from heat conducting and heat resistant material. The disk may be provided with coolant passages. (4 claims, 3 illustr).
J *Ceqm.545*

PRODUCTION, GRADING & RECOVERY OF ABRASIVE PARTICLES

Photomicrographs in relief

A. R. Roy (Diamond Research Lab). *Industr Diam Rev* 1960 Vol 20 (231) pp 26-28 (Feb)

Modifications were made to standard equipment to make it suitable for photographing diamond particles at 25 to 50 magnifications. The need for these modifications became apparant during investigations into the efficiencies of various diamond grits in resin bonded grinding wheels which were described in earlier issues of this journal. The camera is described and the technique explained, while photographs taken by the camera illustrate its successful use. 5 illustr.
D *Km:Cz Wcf*

Study of the accuracy of particle size analysis. Untersuchungen zur Genauigkeit der Kornanalyse

H. Rumpf. *Staub* 1960 Vol 20 (8) pp 253-266 (Aug 1) (In German, abstrs in English, French, and German)

Particle size analysis arranges a collection of particles according to certain properties, the 'dispersion factors', and determines the associated quantities. Geometrical values or a measure of the substance composition or the terminal velocity is employed as the dispersion factor depending on the type of method. The dispersion factor cannot always be unambiguously defined but is subject to a variation which leads to an inaccuracy in the analysis. In the second part of the paper, a survey is given of the methods of measurement: the magnitudes measured, the dispersion factors and the quantities which can be determined from them, and the nature of the functional relationship, are all discussed. Finally, the result of a quantitative error analysis is reported for the statistical quality error and for the sedimentation analysis using the pipette apparatus. 16 illustr, 29 ref, 3 tables.
A *Vgf.21*

The measurement of particle size of ultrafine powders by the air permeability method

M. Arakawa, E. Saito. *J chem Soc Japan* 1960 Vol 63 (4) pp 556-559 (Apr) (In Japanese)

7 illustr, 1 table. *A* *Vgf*

63rd Annual Meeting—Symposia and sessions [:] Metallographic specimen preparation

Anon. *Bull Amer Soc Test Mat* 1960 (247) p 12 (July)

Many new techniques were evaluated, while several papers pointed out the usefulness of diamond abrasive in performing jobs that had previously proved difficult.
D *Bfa Ceq Km*

An automatic particle counter and sizer

H. A. Dell, D. S. Hobbs, M. S. Richards. *Philips tech Rev* 1960 Vol 21 (9) pp 253-267 (Aug 4)

Considerable attention has been paid in the last decade to the problem of automatically performing counting and sizing of samples of particles. This article gives an introduction to the problem and describes an advanced instrument for this purpose developed by the Mullard Research Laboratories. 18 illustr, 19 ref, 1 table.
D *Vgf*

The use of a new kind of precision micro-sieve for grain-size analysis

O. Lauer. *Staub* 1960 Vol 20 (3) pp 69-71 (Mar 1); *Industr Diam Rev* 1960 Vol 20 (235) pp 110-114 (June) (In English, original in German)

See *Industr Diam Abstr* 1960 Vol 17 p A111 (Apr).
D *Vgh*

BP 826,729 (June 22, 1955) **J. Wilkinson, Carborundum Co**

Abrasive articles

A rubber, resin, or shellac bonded grinding wheel, which may have a powdered filler, contains a mixture of abrasive grains and negligibly abrasive non-metallic inorganic grains, B.S. 60 mesh or coarser, which function as extreme pressure lubricants and as granular grinding assistants. Grinding assistants containing sulphur, chlorine, fluorine, or phosphorus are particularly beneficial. Preferably the volume ratio of abrasive to assistant is 9 : 1 to 4 : 1. Such wheels have a much higher metal removal rate, while burning and heat hardening is greatly reduced. (6 claims).
J *Pe Ur.21.545*

USP 2,920,947 (Nov 13, 1956) **E. R. Burk, E. H. Keller, D. J. O'Flynn, E. I. Du Pont de Nemours & Co**

Bristles for abrading surfaces

This specification refers to industrial rotary brushes with synthetic linear polyamide bristles for abrading surfaces of metal, glass, et cetera. Such brushes have not retained satisfactorily the abrasive or polishing particles, *eg* silicon carbide, aluminium oxide, jeweller's rouge. It has been discovered that a dispersion or solution of polyamide at the bristle surface results in far better adhesion of the abrasive than is possible without coatings. The bristles may be coated with the dispersion containing the abrasive as a fine powder; the dispersed polyamide may subsequently be baked on the bristles, evaporating the liquid medium of the dispersion on the bristles and heating to about 210° centigrade. (4 claims, 1 illustr). Ref cited : 5 USP.

J *Pv Rd.545*

TOOL PRODUCTION

Largest continuous rim one-piece metal alloy bond grinding wheel

Action Diamond Tool Co, 4545 W Grand Ave, Chicago 39, Ill. *Grinding & Finishing* 1960 Vol 6 (8) p 48 (Aug)

A continuous one-piece metal alloy bond diamond wheel, 24 in. in diameter, has been developed. According to the manufacturer, the wheel is the largest of its kind and was made by the company's patented pressure cast process. Continuous rim wheels offer many operating advantages over segmented wheels, such as increased wheel life, better finishes and stock removal performance. In addition, the design is claimed to reduce edge chipping friction and wheel cost. 1 illustr. *D* *Nv Urc*

12 steps to retip TC drill steel

J. A. Brown. *Engng Min J* 1960 Vol 161 (8) pp 94-97 (Aug)

A successful technique for the re-tipping and manufacture of tungsten carbide integral rock drill steel has been developed at the Zinc Corp Ltd, Broken Hill, Australia. The technique is based on the use of a high temperature liquid salt bath. 8 illustr.

D *Plb Qc*

The manufacture of special cutting tools and tooling equipment

Aldridge Tool & Engineering Co Ltd. *Brit Mach Tool Engng* 1960 Vol 42 (1) pp 9-17 (Spring)

Machines used include Churchill precision grinders and Oerlikon Profile Cutter Grinders. All tools are tested for hardness, dimensional accuracy, and surface finish. 29 illustr. *A* *Chc Pr:P*

Optical profile grinding developments

A. G. Arend. *Mfg Opt* 1960 Vol 13 (10) p 481 (Aug)

The production of contour gauges and forming tools by grinding from hardened steel has been materially assisted by a form of optical profile grinding machine, which is designed for directly finishing the desired contour. After the outline to be generated is drawn up enlarged fifty times, this drawing is fastened to the table of the outfit. Using a tracer attached to the free-end of a pantograph linkage, the enlarged outline drawing is then followed point by point. Devices and operation are discussed. *D* *Chchz Pr*

New developments in grinding machine construction. Neuentwicklungen aus dem Schleifmaschinenbau

F. W. Lohr. *Die Maschine* 1960 Vol 14 (1) pp 37-38 (Jan) (In German)

A *Chc Pr Qb.132*

Activities at the works of Precision Gear Machines & Tools, Ltd

Precision Gear Machines & Tools Ltd, Coventry. *Machinery, Lond* 1960 Vol 97 (2496) pp 635-637 (Sep 14)

Includes descriptions of grinding ball tracks on Matrix worm and thread grinders. 6 illustr.

See also *Industr Diam Abstr* 1960 Vol 17 p A240 (Oct). *D* *Chcp Pr/Chcq Pr*

USP 2,910,810 (Apr 2, 1958) **E. Fuchs, Wagner & Englert GmbH**

Grinding wheel

A large diameter ceramic or 'Bakelite' bonded wheel is divided into an outer and an inner annular zone, concentrically arranged about a common bore. The outer zone extends through the whole thickness of the wheel. The inner zone consists of two or more juxtaposed portions, with a separating layer at right angles to the axis of the wheel between these portions, so that the wheel can easily be divided into two or more small diameter wheels when the outer large diameter zone has been used up. The two zones are made of different grain mixtures and hardness corresponding to their different sizes. (4 claims, 2 illustr). Ref cited : 4 USP.

J *Pe Urb.545*

Swiss P 342,112 **C. A. Redfarn**

(July 19, 1954; July 13, 1955—conv date, Gt Britain)

Abrasive article and method of manufacturing this article. Article abrasif et procédé de fabrication de cet article

(3 claims). *D* *Pe Qc.545*

FP 1,202,444 (July 17, 1958) **J. Soussaline, Soc An Socam**

Reinforced cold formed grinding wheel. Meule agglomérée à froid renforcée

The grinding wheel belongs to the class of wheels cold formed with a magnesia cement, or another cement which is used cold, or with a polymerizable material using a catalyst effecting polymerization without heating or heating to less than 150° centigrade. Such wheels are often very thick, up to 200 mm, and rotate at relatively slow speeds of 15 to 22 m/second. When such wheels are reinforced by fibres, *eg* of glass, nylon, or any other synthetic or vegetable material, a stratification results which permits the speed to be increased to 80 m/second. The reinforcing tissues preferably are disposed perpendicular to the axis of the wheel and judiciously distributed in the mass. Any abrasive may be employed, *eg* sand, corundum, silicon carbide, emery. (1 claim).

J *Pe.21.541*

DBP 973,182 (Dec 17, 1959) **C. Ballhausen, Deutsche Edelstahlwerke AG**

The use of a powder mixture according to Patent 972,437 as a means for applying hard metal to saw blades for cutting rock and method of making such saw blades. Verwendung eines Pulvergemisches nach Patent 972.437 als Mittel zum Auftragen von Hartmetall auf Saegblaetter fuer die Gesteinsbearbeitung und Verfahren zur Herstellung solcher Saegblaetter

(3 claims, 1 illustr). Ref cited : 1 DPB, 2 BP, 1 USP, 4 publications. *D* *Bn Ceq Pc.545*

POWDER METALLURGY

Hardness in metal bonded wheels

Anon. *Grinding & Finishing* 1960 Vol 6 (8) p 21 (Aug)

Reply to reader's letter.

Of the three types of diamond wheel, vitrified, resinoid, and metal bonded, the latter two have virtually no porosity. Grade in vitrified diamond wheels is changed by varying the volume per cent of abrasive, bond and pores. Grade variations of resinoid bonded diamond wheels are achieved by changes in bond mix. Metal bonded diamond wheels, a product of powder metallurgy, are varied in grade by altering the type of powdered metal. The progression is from softer bronzes used to provide the softer grade wheels, to harder bronze to steel for the hardest wheels.

D *Nv Urb*Nv Urc*Nv Urf/Nv Urc:Unh*

Methods of measurement in powder metallurgy. Messmethoden in der Pulvermetallurgie

K. Torkar. *Staub* 1960 Vol 20 (8) pp 299-302 (Aug 1) (In German, abstrs in English, French, and German)

Since powder metallurgy is very closely associated with the characterization of powders, parallels can be drawn between it and dust technology. The methods for characterization of very fine powders with respect to particle size and specific surface are discussed. The activation of a powder and its surface is examined in detail and it is shown with examples that, as a result of their 'activity', powders behave differently from the compact material, and, indeed, powders react more quickly and violently than the same material in the compact stone. 1 illustr, 1 table.

A *Qt Vgf*

New sintered carbides for machining

J. Chmelik. *Strojirenska vyroba* 1959 Vol 7 (5) pp 191-195 ; abstr *Cobalt* 1960 (6) p 85 ; *Metal Powd Rep* 1960 Vol 14 (8) pp 150-151 (Apr) (In Czech, abstrs in English)

D *Pdc*

Bonding carbide to steel

Anon. *Tool Engr* 1960 Vol 45 (2) pp 143-144 (Aug)

Many potential applications of tungsten carbide tools have been hampered by the weakness of the joint between carbide and steel. A new method, employing the powder metallurgy technique, involves relatively low time, temperature, and pressure of bonding, a wafer of the bonding material being diffused to create a strong and shock resistant joint. It is expected that this work will result in new uses of carbide and other refractory metals being made possible.

D *Rgd:Cs Rw*

Damping cutting vibrations

H. Frommelt. *Machinery, Lond* 1960 Vol 97 (2493) pp 448-450 (Aug 24)

Some further examples of results obtained with cutter bodies of copper infiltrated powder iron. 5 illustr.

See also *Industr Diam Abstr* 1960 Vol 17 p A199 (Aug). *X* *Bfy Psp/Pd Qp*

MISCELLANEOUS

Historical diamonds : 'The Shah of Persia'

Anon. *'Mindrill' Bits & Pieces* 1960 Vol 13 (4) p 5 (June)

D *Kb*

International standards for machine tools

Anon. *S Afr Min Engng J* 1960 Vol 71 Pt 2 (3525) p 521 (Aug 26)

A number of international standards for machine tools are being considered by member nations of the International Organization for Standardization (ISO). Two standards, approved by members and submitted to the ISO Council as ISO Recommendations, cover lathe tool posts and speeds and feeds for machine tools. Other proposals are listed.

D *Pr.255.31*

Test charts for jigs and fixtures

Skoda Works, Pilsen, Czechoslovakia. *New Scientist* 1960 Vol 8 (200) p 723 (Sep 15)

Exhaustive investigations have been carried out with the object of creating conditions for determining the ultimate precision of jigs and fixtures. Recommended values of tolerances have been worked out and methods for checking accuracy are recommended. The tolerances have been fixed with reference to the accuracy of modern machine tools.

D *Psc.1312.5135/Pu.1312.5135*

Highlights of Production Engineering Show

Anon. *Canad Mach & Metalworking* 1960 Vol 71 (8) pp 126-128, 134, 136, 138, 140, 142 (Aug)

Held in conjunction with the National Machine Tool Builders' Association exhibition in Chicago, this show included grinding machines, hardness testers, and many varieties of machine tools and attachments. Among these, the No 1014-5 diamond commutator turning tool, is designed by Arthur A. Crafts Co specifically for turning commutators of fractional h.p. motors. Many machines are photographed.

D *Ah Ceqb Nf/Vwkc.27.342*

Flow manufacture is the key to Russia's machine tool production plan

Anon. *Metalworking Prod* 1960 Vol 104 (33) pp 11-13 (Aug 17)

1 illustr, 2 tables. *D* *Pr.13.33*

Tool economics

H. Conn. *Mach Tool Blue Bk* 1960 Vol 55 (8) pp 91, 93-94 (Aug)

1 illustr, 1 ref. *D* *Pd.145*

Machine tool trends in Hungary

Technoimpex, PO Box 183, Budapest 62. *Mach Lloyd* 1960 Vol 32 (16A) pp 26-27 (Aug 6) (In English, abstrs in German and French)

Some of the technical features of Hungarian machine tools at the 1960 Leipzig Fair are described. 4 illustr.

D *Pr.25.329*

Orbituary : Prof. Max von Laue, For.Mem.R.S.

P. Rosbaud. *Nature, Lond* 1960 Vol 187 (4739) pp 738-740 (Aug 27)

Prof. Laue's work is reviewed, with special attention to his study of X-ray diffraction by crystals.

D *Bd Unklb.21.292*

Now . . . a foolproof formula for consistent feeds and speeds

T. Johnson. *Amer Mach* 1960 Vol 104 (15) pp 115-122 (July 25)

A new procedure is said to provide a reliable way of obtaining consistent speeds and feeds for any job-shop machining operation. Developed for the Tapco Measured Standard Data Program, the procedure approaches the subject from a new standpoint : tables are based on a constant tool life. 6 illustr.

D *Ceq Psb.131/Ceq Uqf.131*

PUBLICATIONS RECEIVED

BOOK REVIEWS

Textbook of microscopic techniques. Vol 1, Pt 2: Instruments for incidental light microscopes. Handbuch der Mikroskopie in der Technik. Instrumente fuer Auflight-Mikroskopie, Band 1/Teil 2

H. Freund. Umschau Verlag, Frankfurt a/Main. 1960, 757 pp, illustr. (In German)

This part of the first volume is devoted to incidental light microscopes and contains eleven articles on the different aspects of the subject, including one on microscopic hardness testing. The choice of specimens, preparation of slides, development and use of high-temperature microscopes, and use of interference microscopes and photographic apparatus are all discussed in detail. A subject index is provided at the back of the book, and a complete analysis of each chapter follows the index of chapters at the beginning. The work is beautifully produced with abundant illustrations and clear arrangement of the material under sub-headings. *A* *Vj.52*

Williamson Diamonds Limited, Mwadui, Tanganyika

Booklet, 16 pp, illustr

A brief history of the mine is given and the present-day township is described. The mining method is an open-cast quarrying operation in the area of the pipe, and will follow this pattern for some years. The mine has one of the most modern diamond treatment plants in the world, using the heavy media separation process, the electrostatic system, as well as the grease belt method for diamond recovery.

D *F Hd.57*

TRADE LITERATURE

Catalog of specific grading recommendations

Carborundum Co, Bonded Abrasives Div, Niagara Falls, NY. 60 pp, 8½ × 12 in.

Basic considerations involving wheel selection include: the kind of material; amount of stock removal, accuracy, finish, and rate of production required; wheel size; type of grinding machine; wheel and work speed; and operator skill. It is stressed that while correct wheel selection can be greatly aided by using recommended grading listed here, such choices should never be regarded as final. *D* *Rd Vg.254.57*

Covel precision grinders

Covel Precision Grinders, Benton Harbor, Mich. 4 pp, 11 × 8½ in., illustr

Six models are described and photographed, including the No 10-H hydraulic surface grinder, claimed to be twice as fast as other mechanical feed machines of the same size. *D* *Chcm Pr/Chcw Pr*

British Bellows Controlled Air Power Equipment

Geo H. Hughes Ltd, Tyburn, Birmingham 24. 8 pp, 8 × 10 in., illustr

Cylinders, valves, drill feed units, and hydro-check are described, and examples are given of successful applications of Controlled Air Power Equipment to various operations. *D* *Prz.57*

LITERATURE REQUESTS
When applying for the loan of literature abstracted in this journal, please quote the title of the article, the name of the author, and the number of the page on which it appeared.

Portable grinding machines—safe and efficient operation

Grinding Wheel Institute, 2130 Keith Bldg, Cleveland 15, Ohio. 1947, 20 pp, illustr

The purpose of this booklet is to outline the conditions that are likely to cause trouble and provide information regarding the safe use of portable grinding machines. Causes of wheel breakage include improper wheel mountings, incorrect speeds and generally bad and careless usage. The ASA Safety Code requirements are quoted. A table shows correct speeds.

D *Chc Prw.526*

British Standards Institution Annual Report 1959-1960

British Standards Institution, British Standards Hse, 2 Park St, London W 1. 1960, 282 pp. Price 7s 6d

A report of the Institution's activities 1959-60 in four parts: a general report, divisional reports, international activities, and a list of councils, committees, and officers of the institution. International activities include a report on the French Committee's recommendations on machine tools: work is proceeding on grinding wheel hub flanges, for example. Under consideration in the USSR are comments made on a draft programme of future work to include precision reference specimens for the calibration of stylus-type and optical instruments, and roughness comparison specimens. This Annual Report forms a companion volume to the BSI Yearbook. *D* *.243.255.321:.2232*

Diamond indenters for Rockwell and Vickers hardness testing of materials

Komitet Standartov Mer: Izmeritel'nyh Priborov pri Sovete Ministrov SSSR. GOST 9377: 1960, 6 pp. (In Russian) *D* *B Cvd Nd*

Diamond wheels and hones [:] Catalogue No 25-57

Greenlee Diamond Wheel Co, 1514 W Adams St, Chicago 7, Ill. 8½ × 11 in., 38 pp, illustr

Lists the old and new diamond wheel designations, established by the American Standard Identification Code for diamond wheel shapes. Diamond marking, care and maintenance of diamond wheels, and wheel speeds are covered, as well as specifications of the types of diamond wheel and hone manufactured. A supplement provides details of metal bonded electrolytic diamond wheels.

D *Nqe.254.57/Nv.254.57*

Elgin diamond wheels

Elgin National Watch Co, Elgin, Ill. Loose leaf folder, 44 pp, 8½ × 11 in., illustr

The new identification code for diamond wheel shapes, designated by the American Standards Association involves four steps: choosing the basic core shape, shape of diamond cross section, location of diamond section, and selection of modification. These steps are illustrated. After general advice on Elgin diamond wheel usage, specifications are given of resinoid, metal, and vitrified bonded wheels. *D* *Nv.57*

Hammond DusKolectors—Hammond MistKolectors

Hammond Machinery Builders Inc, 1600 Douglas Ave, Kalamazoo, Mich. 12 pp, 8½ × 11 in., illustr

Particular models are described and general applications of both Filter DusKolectors and Cyclone DusKolectors are explained. Photographs show models connected to cutter grinders, drilling machines, et cetera.

D *Pr Pu.57*

Vickers Pyramid Hardness Testing Machine for accurate determination of the hardness of metals

Vickers-Armstrongs (Engineers) Ltd, 13 City Rd, London EC 1. 19 pp, 8½ × 11¼ in., illustr

The Vickers Pyramid Hardness Testing Machine, using calibrated weights acting through the medium of a simple lever system, with an accurately cut diamond indenter and micrometric means of measuring the impression formed, enables accurate, proportioned tests to be made which are expressed in units internationally recognized and conforming to B.S.I. requirements. The present machine, of which specifications are given, incorporates a special Knife Edge Unit to ensure the greatest sensitivity of the beam when using light loads down to a minimum of 1 kilo. Accessories include a gear testing attachment, sliding table arrangements for testing without winding the stage up and down, and an extended diamond and objective unit for testing ball races and places difficult to reach. If desired, the Vickers machine can be used as an accurate form of light load Brinell tester.

D *Bf Cvd Nde Wghc.57*

Metallurgical instruments

Nash and Thompson Ltd, Oakcroft Rd, Chessington, Surrey. 8 pp, 8 × 10 in., illustr

The preparation of metallographic specimens before etching and microscopic examination entails the production of a perfectly flat and highly polished surface. To help in this aim two instruments are available, a press for mounting specimens in a plastic matrix, and a polisher working on the electrolytic principle. Each is described.

See also *Industr Diam Abstr* 1960 Vol 17 p A297 (Nov).

D *Bfa Unf Vfd W*

Cemented [sintered] carbides for industry

Allegheny Ludlum Steel Corp, Carmet Div, Pittsburgh 22, Pa. 32 pp, 8½ × 11 in., illustr

The catalogue is divided into five sections covering brazed tools, inserts, tool holders, blanks, and general information. Qualities and applications of the various grades of sintered carbides supplied are explained, and a chart shows how those in the CA-600 series compare in crater resistance, edge wear resistance and shock resistance. Speed and feed charts are also provided.

D *Pdc.57*

Suggestions for the handling of fine grinding tools

Degussa, Dept Degussit, Frankfurt/M, Germany; British Rep: Bush Beach & Segner Bayey Ltd, St James Hse, 44 Brazennose St, Manchester 2. 5 pp, 6 × 8¼ in.

Advice on diamond dressing of grinding and burnishing wheels is included.

D *Ab Cg Nj.57/Pe.57*

Model 738 microhoner machine

A. A. Jones & Shipman Ltd, Narborough Rd South, Leicester. 1 p, 8¼ × 11 in., illustr

Intended mainly for small diameter parts, this mechanical stroke machine has the speeds and controls necessary to microhone short bores. Specifications are given.

D *Chhc Pr.57*

Bellows-Airborne Infeed Grinder Control System

Bellows Co, Akron 9, Ohio. 9 pp, 8½ × 11 in., illustr

The Bel Air unit has been developed for production grinding operations where consistently accurate tolerances have to be held within 0.0002 inch. Installation procedure of the four main components is explained and operating instructions are given.

D *Chc Pr.57*

UHM-UVA automatic internal grinders

Ulvsunda Verkstaeder AB, Stockholm-Bromma, Sweden. Folder, 8¼ × 11¼ in., illustr

Describes three automatic internal grinders: standard model UHM-195, special model UHMV-195 with face grinding attachment, and special model UHM-295 with extra large swing. It is said that these machines enable even moderate size batches to be ground automatically to closer tolerances and more profitably. Flexibility, precision, and speed are among qualities claimed. UVA diamond sizing enables automatic sizing to be used on jobs where gauge sizing would be impossible. The position of the dressing diamond and length of finishing feed are used as size determinants. Various accessories are described.

D *Chcn Pr.57*

The complete industrial diamond service ... Spectrum microfinishing and precision lapping compounds and accessories

Penn Scientific Products Co, Abington, Pa. Loose leaf folder, 8½ × 11 in., illustr

A comprehensive catalogue covering Spectrum diamond compounds, accessories, *etc*, and Pensco diamond wheels, hones, tools, mounted points, pure diamond powders, dual wheels, and carbide burrs and end mills. The technique of using the various products is explained with the help of diagrams and definitions, and advice is given on ordering them.

D *N.57*

Autoset Type N 271

Airmec Ltd, High Wycombe, Bucks. 8¼ × 10½ in., 8 pp, illustr.

Autoset Type N271 has been designed to provide accurate remote control of machines employing co-ordinate tables. It is suitable for fitting to most types of boring, punching, and single or multi-spindle drilling machines. Various features are described and specifications given.

See also *Industr Diam Abstr* 1960 Vol 17 p A39 (Feb).

D *Cfb Pr Wpb.57*

Divided circles of high accuracy, diffraction gratings for spectrometry, gratings for metrology, diffraction gratings for demonstration graticules, linear scales, reference bars

Paton Hawksley, Rockhill Labs, Keynsham, Bristol. Loose leaf folder, 8 × 10½ in.

Gives particulars of the various diffraction gratings for metrology produced by the company, which has introduced an optical system employing a shuttering system instead of moiré fringes. The system is used in the manufacture of a universal sensing head.

D *Tfd.57*

The Atlas—'Standard' wheel profile truing machine

Atlas Engineering Co, 48 Princes Gate, London SW 7. 8 pp, 8½ × 11 in., illustr

The machine, for profiling wheel threads and flanges on various railway vehicles, has two cutter heads which operate simultaneously on a pair of wheels. Each cutter has ten blades and each blade is fitted with eleven Atlas 'Mitia' Carbide Button Cutters: the buttons can be turned to sixteen new positions on each side. It is calculated that between 280 to 300 wheels can be profiled with one set of these cutters, and most wheels can be re-profiled in one cut.

D *Ab Cgf Psf.57*

LITERATURE REQUESTS

Please quote the page number of the Bibliography containing the original reference, and the author and title of the article, in all cases.

A selection of new machine tools

Stedall Machine Tool Co, 192-204 Pentonville Rd, London N 1. 28 pp, 6¼ × 8¼ in., illustr

Machines are listed with prices under various sections, *eg* drilling and grinding, and some are illustrated and described. Among the latter is the Lorch precis.on instrument lathe, Type LLS, especially suitable for research, and the instrument, optical, and electronic industries; and the Stedall carbide tool grinder for which a supply of diamond impregnated wheels is available. *D Al Bkc Chc Nv Pr.57*

Instructional film by Carborundum

Carborundum Co Ltd, Trafford Park, Manchester 17. 16 pp, 8½ × 5½ in., illustr

Details of how to obtain these 16 mm films are given, together with brief descriptions of individual films, which include 'The truing and dressing of grinding wheels', 'Grinding a giant telescope mirror', and 'Sparkling performance'. The latter indicates the great value of industrial diamonds in the present-day engineering, stone and glass trades.
D Ab Cg.58/N.58

Drill masonry fast in any position 'around the clock' with Truco Portable Diamond Drilling Units

Truco Masonry Drilling Div, Wheel Trueing Tool Co., Detroit 38, Mich. Folder, 3½ × 6¼ in., illustr

Illustrates various models of portable diamond drilling equipment, claimed to enable drilling of reinforced concrete in any position and at any time. Substantial savings in drilling costs are said to be made for four reasons: versatility, outstanding performance, the complete line of equipment available, and the fact that Truco drills often pay for themselves almost immediately. Various examples of performance are given. *D Bn Cfb Nh.57*

Truco blades and saws

Truco Masonry Drilling Div, Wheel Trueing Tool Co, Detroit 38, Mich. 4 pp, 8½ × 11 in., illustr

Blades include TruBond diamond blades with metallic bond in standard sizes from 10 in. to 36 inches. Truco diamond drill bits and diamond masonry drill bits are mentioned. *D Ngb.57/Nh.57*

PATENT LISTS

BRITISH

The Official Journal (Patents) 1960 (3733) (Aug 31)

852,711 CLEVELAND TWIST DRILL CO. Tipped oil-conduit drills.

The Official Journal (Patents) 1960 (3735) (Sep 14)

853,376 NELDAS, N. T. Devices for boring holes of large diameter in hard ground or rock.

853,503 UNION CARBIDE CORPORATION. Process and apparatus for piercing rock and the like.

The Official Journal (Patents) 1960 (3736) (Sep 21)

854,487 COMPAGNIE DE SAINT-GOBAIN, formerly MANUFACTURES DE GLACES ET PRODUITS CHIMIQUES DE SAINT GOBAIN, CHAUNY & CIREY SA DES. Apparatus for simultaneously grinding the two faces of a glass sheet.

854,276 ZEISS-STIFTUNG, C. [trading as ZEISS, C. (Firm of)]. Apparatus for working materials by means of a beam of charged particles.

854,277 ZEISS-STIFTUNG, C. [trading as ZEISS, C. (Firm of)]. Beam generating system for producing a high intensity beam of charged particles.

UNITED STATES

Official Gazette 1960 Vol 757 (1-5) (Aug)

2,947,056 I. CSORDAS, B. LANYI, Z. VERESS, L. VISSY, KABD-ES-MUANYAGGYAR. Sintered alumina articles and a process for the production thereof.

2,947,082 H. EPSTEIN. Crystal driven dental tool.

2,947,121 L. COES jun, NORTON CO. Grinding wheel and wheel diameter measuring apparatus.

2,947,123 G. E. DYGERT, E. WARREN. Watchmaker tool.

2,947,302 H. B. PATTERSON, BRYANT CHUCKING GRINDER CO. Art of dressing grinding wheels.

2,947,608 T. HALL, GENERAL ELECTRIC CO. Diamond synthesis.

2,947,609 H. M. STRONG, GENERAL ELECTRIC CO. Diamond synthesis.

2,947,610 H. T. HALL, H. M. STRONG, R. H. WENTORF jun, GENERAL ELECTRIC CO. Diamond synthesis.

2,947,611 F. P. BUNDY, GENERAL ELECTRIC CO. Diamond synthesis.

2,947,616 L. COES jun, M. S. CHAMPAGNE, NORTON CO. Grinding wheel structure.

2,947,617 R. H. WENTORF jun, GENERAL ELECTRIC CO. Abrasive material and preparation thereof.

2,948,090 C. KLINGSPOR. Abrasive wheels.

2,948,991 E. L. WALTERS, A. H. MILLER, LIBBEY-OWENS FORD GLASS CO. Automatic glass cutting machine.

2,948,997 A. K. SEIRIG, A. ENDERS, H. J. STRUNK, WERNICKE & CO KG. Adjusting device for grinding disks.

2,949,351 L. E. VIGLIATURA jun. Heat resistant abrasive wheels.

2,949,707 D. H. STAELIN. Method and apparatus for grinding and polishing sheet glass.

2,950,087 J. N. GREGORY. Combined rotary and percussion drilling.

2,950,523 H. A. FROMMELT, F. ABERLIN, J. A. BITTERLI, W. G. HESSLER. Cutting tool and method of making.

2,950,524 H. A. FROMMELT, F. A. ABERLIN, J. A. BITTERLI, W. G. HESSLER. Means for mounting cutter bits or blades.

2,950,578 E. FOUQUET. Grinding machine with tool dressing means.

2,950,579 E. F. FOX. Automatic machine for cutting hypodermic needles from steel tubes.

2,950,582 A. D. BEAUCHAINE. Centre insert for abrasive wheels.

2,950,617 W. J. CAMPBELL. Device for testing the abrasion-resistance of surfaces of metallic articles.

2,951,142 W. ULLMANN, AGIE, AG FUER INDUSTRIELLE ELEKTRONIC. Method and arrangement for spark erosion by alternating current.

SOUTH AFRICAN

Official Journal 1960 Vol 13 (30-33) (July-Aug)

513/59 M. T. GLADSTONE, NORTON CO. Coated abrasives.

60/833 E. A. POKORNY. Re-claiming of diamond from all sorts of waste material.

AUSTRALIAN

Official Journal 1960 Vol 30 (24-28) (July-Aug)

228,863 R. BREUNING. Boring bar.

SWISS

Patentliste 1960 (14-15) (July-Aug)

347,912 J. STANEK, J. KUNC, VYSKUMNY USTAV FORE MECHANIZACIU A AUTOMATIZACIU. Device for the automatic control of the feed and/or the pressure of the tool of electro-erosive cutting devices.

348,067 A. FUMIA, GLEASON WORKS. Machine for grinding milling cutters for cutting toothed workpieces.

348,068 E. FOUQUET. Grinding device.

348,069 K. MAEGERLE, GEBR MAEGERLE AG. Method of grinding spline shafts and device for carrying out the method.

FRENCH

Bulletin Officiel 1960 Vol 1 (32-35) (Aug-Sep)

1,238,999 FIRMA DIPL ING JOHANN STELLWAG. Die.

1,239,002 DIPL ING BURKHARDT, EISENWERK HENSEL BAYREUTH. Stone saw.

1,239,056 F. L. CHRISTENSEN, CHRISTENSEN DIAMOND PRODUCTS CO. Device for cutting by abrasion.

1,239,157 D. E. BIRT, P. J. PIKE, ELECTRIC & MUSICAL INDUSTRIES LTD. Method of fixing precious stones on metallic pieces. pieces.

1,239,701 SOLID-WERK GEORG EHNI. Grinding machine with crosswise-arranged grinding spindles.

1,239,437 A. LABECKI, ETS NYRPIC (ATELIERS NEYRET-BEYLIER & PICARD-PICTET). Drilling tools.

1,239,913 H. L. HOOVE, E. J. DUPRE, W. J. RANKIN, MINNESOTA MINING AND MANUFACTURING CO. Abrasive and its method of manufacture.

1,240,167 TEXTRON INC. Machine for preparing by abrasion the rims of ophthalmic lenses.

1,240,395 NV PHILIPS' GLOEILAMPENFABRIEKEN. Method of diamond drilling.

1,240,005 W. TIRASPOLSKY. Core drill or similar tool for earth drilling.

1,240,396 NV PHILIPS' GLOEILAMPENFABRIEKEN. Object provided with a diamond, particularly a diamond gramophone needle, and method of its manufacture.

1,240,869 NV PHILIPS' GLOEILAMPENFABRIEKEN. Method of diamond drilling.

1,240,753 J. B. BAKER, TIMKEN ROLLER BEARING CO. Inserts for drilling rods provided with cutting edges having one or more inserts.

GERMAN

Patentblatt 1960 Vol 80 (34-37) (Aug-Sep)

Applications Open to Public Inspection

1,087,545 H.-J. BERGING, HAMBORNER BERBAU AG. Double core tube for core drilling.

1,087,928 A. MERTENS, ROHDE & DOERRENBERG. Device for profiling grinding wheels by means of truing diamonds.

1,088,408 WALLRAM HARTMETALL GmbH. Tool for stone working.

1,088,838 A. LEISSCHNER, MSO MASCHINEN- U SCHLEIFMITTELWERKE AG. Truing device for profile grinding wheels, in particular for grinding threads with straight, convex, or concave profiles.

1,088,839 E. STILTZ, LICENTIA PATENT-VERWALTUNGS GmbH. Electric tool.

1,088,856 A. SCHMERMUND. Machine for cutting tobacco.

1,088,865 A. STIHL. Sawing chain for stone.

AUSTRIAN

Patentblatt 1960 Vol 57 (7-9) (July-Sep)

210,706 TH CALOW & CO. Cutting body.

210,781 HERMINGHAUSEN-WERKE GmbH. Truing device for the control wheel of centreless circular grinders for through-feed grinding.

210,808 SKANDNAVISKA GRANIT AB. Saw blade for stone sawing machines.

211,186 INTERNATIONAL PRECISION WHEEL CORP. Grinding wheel.

211,187 E. FOUQUET. Method and device for making grinding worms and grinding worm made by this method.

211,446 H.-J.-SCHULZ, H. SCHIERHOLT, R. SATTLER, DEUTSCHE EDELSTAHLWERKE AG, ALLGEMEINE ELECTRIZITAETSGES. Spark-erosion machine with a device for flushing the spark gap.

211,576 M. De VRIES. Tracer for grooves.

211,697 MINNESOTA MINING & MFG CO. Method of making grinding wheels.

LITERATURE REQUESTS

Please quote the page number of the journal which contains the original reference, and the author and title of the article, in all cases.

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. . . and a close shave

The Industrial Diamond Trade Names Index is now in preparation. Those firms who have not yet returned their forms are reminded that there is not much time left in which to do so: a delay in returning the form could result in the firm's name being missed from the Index.

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IDR REPRINT SERVICE

The following reprints are now available from Industrial Diamond Information Bureau, 2 Charterhouse Street, London EC 1, at a charge of 1s each, post free :

C 99—Diamond. Part 1, by S. Tolansky (*Contemporary Physics* 1959).

C 100—Diamond. Part 2, by S. Tolansky (*Contemporary Physics* 1960).

I 254—Test blocks for indentation hardness testing, by J. G. Wood (*IDR* 1959).

I 255—The practical realization of the HV and HR scales, by R. S. Marriner (*IDR* 1959).

I 256—A film for recording the reactions in the diamond wheel structure, by K. E. Schwartz (*IDR* 1959).

I 257—The grinding technique and its importance for the proper use of carbides in the wood-working industry, by T. Englesson (*IDR* 1959).

I 258—Some growth characteristics of synthetic diamonds : a distinction between natural and synthetic diamond, by S. Tolansky and I. Sunagawa (*IDR* 1960).

I 259—Interferometric studies on synthetic diamonds, by S. Tolansky and I. Sunagawa (*IDR* 1960).

I 260—The use of a new kind of precision micro-sieve for grain-size analysis, by O. Lauer (*IDR* 1960).

I 261—Improvements in diamond drilling and sawing : the effects of soft soap as a wetting agent and softener, by G. B. Dauncey (*IDR* 1960).

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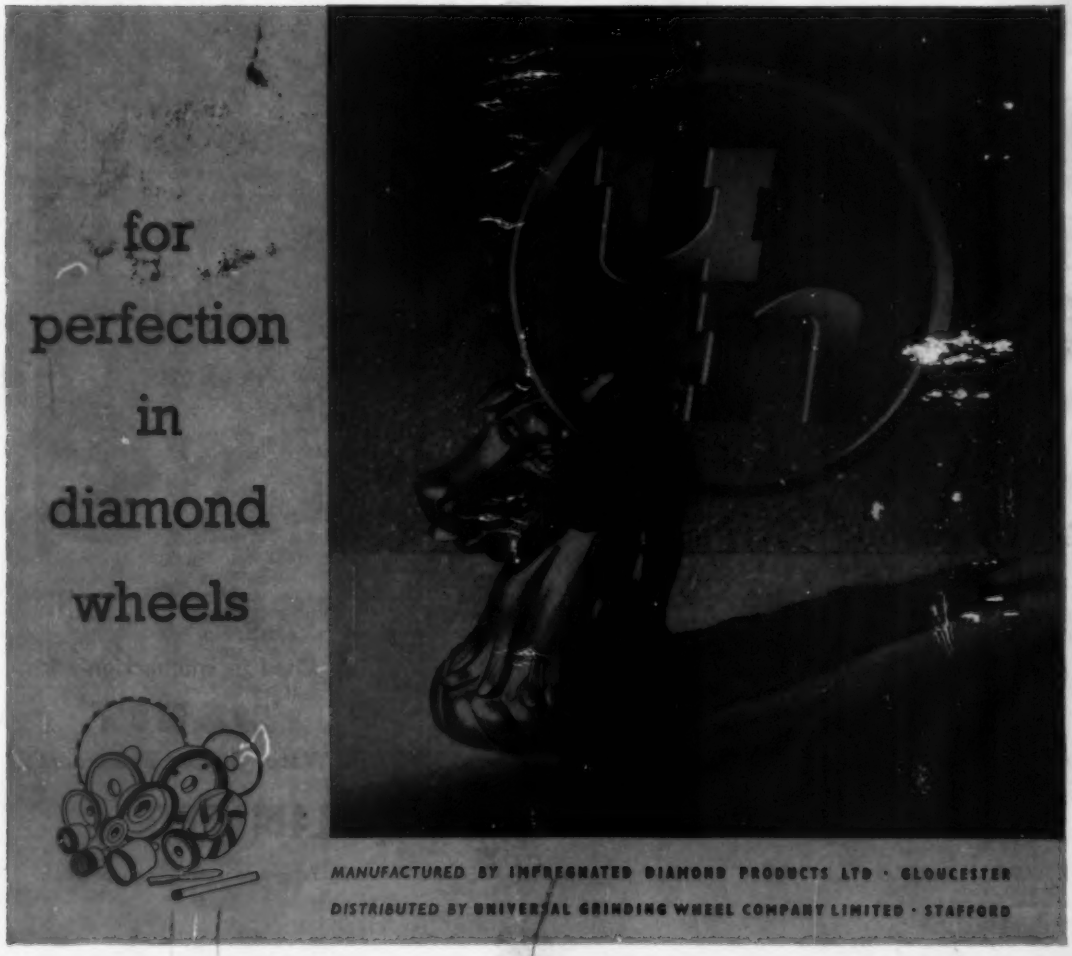
November, 1960 Vol. 20 No. 240